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Denis L. Brown

Shell Oil Products US
HSE – Environmental Services
20945 S. Wilmington Ave.
Carson, CA 90810-1039
Tel (707) 865 0251
Fax (707) 865 2542
Email denis.l.brown@shell.com

April 4, 2005

Barney Chan
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: Sampling, Post-Remediation Site Conceptual Model, and Risk Assessment Report
Former Shell Service Station
1230 14th Street
Oakland, California
SAP Code 129403
Incident No. 97088250

Dear Mr. Chan:

Attached for your review and comment is a copy of the *Sampling, Post-Remediation Site Conceptual Model, and Risk Assessment Report* for the above referenced site. Upon information and belief, I declare, under penalty of perjury, that the information contained in the attached document is true and correct.

If you have any questions or concerns, please call me at (707) 865-0251.

Sincerely,

Denis L. Brown
Sr. Environmental Engineer

.MBRIA

April 4, 2005

Alameda County

APR 0 8 2005

Environmental Health

Mr. Barney Chan
Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502

Re: **Soil Sampling, Post-Remediation Site Conceptual Model, and Risk Assessment Report**
Former Shell Service Station
1230 14th Street
Oakland, California
Incident #: 97088250
Cambria Project #: 247-0233-006

Dear Mr. Chan:

Cambria Environmental Technology, Inc. (Cambria) is submitting this *Soil Sampling, Post-Remediation Site Conceptual Model, and Risk Assessment Report* to Alameda County Health Care Services Agency (ACHCSA) on behalf of Equilon Enterprises LLC dba Shell Oil Products US (Shell). Cambria's March 17, 2005 *Remediation, Verification Sampling, and Post-Remediation Monitoring Report* recommended updating the site's site conceptual model (SCM) and the risk-based corrective action (RBCA) risk assessment based on post-remediation soil and groundwater conditions.

To update the SCM and risk assessment, Cambria recommended:

- Calculating updated representative soil and groundwater concentrations, using the post-remediation soil and groundwater data;
- Revising the site's Tier 2 RBCA analysis (based upon the City of Oakland Public Works Department's January 1, 2000 *Oakland Urban Land Redevelopment Program: Guidance Document [*the ULR RBCA *Guidance Document])* from Cambria's March 7, 2002 *Risk-Based Corrective Action Report;* and
- Advancing three direct-push soil borings to collect soil samples for grain size analysis to confirm the appropriateness of the using the Merritt Sands soil type in the updated RBCA risk assessment.

Cambria recommended that case closure be granted if the updated SCM and RBCA risk assessment showed that site conditions continue to be protective of human health, and if the concentrations of chemicals of concern (COCs) are below the appropriate Oakland Site Specific Target Levels (SSTLs).

Cambria Environmental Technology, Inc.

5900 Hollis Street
Suite A
Emeryville, CA 94608
Tel (510) 420-0700
Fax (510) 420-9170

The SCM presented below updates the SCM originally presented in Cambria's June 6, *2001 Soil Vapor Extraction and Site Investigation Report.* The revised SCM is intended to represent the current post-remediation site conditions. Three soil borings were advanced on March 18, 2005 to collect soil samples for grain size analysis. The results showed that the soil type is consistent with the Merritt Sands soil type. The revised SCM and RBCA risk assessment incorporates all soil and groundwater sampling data collected since the prior SCM and RBCA analysis to evaluate the risks potentially posed by the current site conditions.

SOIL SAMPLING FOR GRAIN SIZE ANALYSIS

Cambria directed the advancement of three soil borings (GS-01 though GS-03) at the site (Figures 1 and 2) to collect soil samples for grain size analysis from two locations outside the former underground storage tank (UST) pit area and from one location within the UST pit (Figure 3).

Drilling Date: March 18, 2005

Drilling Company: Vironex, Inc. of San Leandro, California; C-57 License # 705927.

Cambria Personnel: Martin Wills, Cambria

Drilling Methods: Hand auger and 2-inch hydraulic push

Permit: Alameda County Public Works Agency Permit # W05-0323 (Attachment A)

Soil Sampling: Soil samples were collected at 5 feet below grade (fbg) and 8 fbg from each of the borings.

Number of Borings: Three (GS-01, GS-02, and GS-03)

Boring Depths: 8 feet (ft)

Sediment Lithology: Soil encountered in the borings outside the UST pit (GS-01 and GS-03) consisted of silty sand to the total explored depth of 8 fbg. Fill, consisting of silty sand with gravel, was encountered in the UST pit boring (GS-02). Boring logs are included as Attachment A.

Analyses: Soil samples were analyzed for grain size analysis by ASTM Method D422. The laboratory report is included as Attachment B.

Grain Size Analysis Results: The soil grain size analysis results indicate the native unsaturated soil type is "silty to very silty sand" (SM), according to the Unified Soil Classification System (USCS). These samples contained 71-78% sand, with 0-12% gravel and 16-29% fines (silts or clays). The 5 fbg sample at GS-03 had more gravel than the other native soil sample. The native soils appear to be part of the "Merritt Sands" formation.

Samples GS-02-05 and GS-02-08 were collected from within the filled, former UST pit. The grain size analysis results indicate their USCS soil type would be "silty sand with gravel" (SM). This material appeared to be an engineered fill type material.

SCM

Site History and Land Use

Site History: According to City of Oakland records, the current site building was constructed in 1958. Shell sold the station and property in November 1983. The current owner reportedly purchased the station and property in March 1984. Gas station operations at the site reportedly began in 1958 and ceased in 1993. Four gasoline USTs and one waste-oil storage tank were removed on August 24, 1993.

Site Location and Land Use: This former Shell-branded service station is located at the northeast corner of the 14th Street and Union Street intersection in Oakland (Figures 1 and 2). Currently, an abandoned one-story station building and a pump island canopy occupy the site, and much of the property is unpaved. The adjacent properties to the north and east are residential and both lots have two-story homes. The property to the north (1418-1420 Union Street) reportedly has a half, unfinished basement; the building appears to be constructed with a crawl space. The property to the east (1216 14th Street) reportedly does not have a basement; it appears to be constructed with a slab on grade. The surrounding area's land use is currently residential to the north, south, and east, and is commercial/industrial to the west and southwest. Near the site, 14th Street is a four-lane boulevard with a wide median strip, and Union Street is a two-lane street.

Site Investigation History

February 1991 Soil Borings: On February 2, 1991, Tank Protect Engineering (TPE) of Northern California advanced soil borings SB-1, SB-2, and SB-3. The boring locations are shown on Figure 2 and a copy of TPE's map is included in Attachment C. Maximum concentrations of 1,600 parts per million (ppm) total petroleum hydrocarbons as gasoline (TPHg) and 18 ppm

benzene were detected in the soil sample collected at 10.5 fbg in boring SB-3, located immediately downgradient of the gasoline USTs. Table 1 summarizes the analytical results.

August 1993 Tank Removal and Sampling: On August 24, 1993, TPE supervised the removal of two 7,500-gallon unleaded USTs, one 7,500-gallon leaded UST, one 8,000-gallon leaded UST, and one 550-gallon waste-oil tank from the site. Soil sample S-1 was collected from beneath the fill end of the waste oil tank. Soil samples S-2 through S-9 were collected at depths ranging from 8.5 to 12.0 fbg from the floor of the fuel UST excavation. Two sidewall samples (VSW-1 and VSW-2) were collected at 6.0 ft depth from the west side of the UST pit. Soil samples DS-1 through DS-6 were collected at a depth of 1.0 ft from beneath the former dispensers. A copy of TPE's map showing the UST locations and soil sample locations is included in Attachment C. TPHg and benzene were detected at concentrations ranging from 1.3 ppm to 18,000 ppm and from <5.0 ppm to 11,000 ppm, respectively. Total petroleum hydrocarbons as diesel (TPHd) and oil and grease were detected in the waste-oil tank pit sample at 1,200 ppm and 7,700 ppm, respectively. Maximum concentrations of 13 ppm TPHg and 0.007 ppm benzene were detected in soil samples collected beneath the product dispensers. The tank pit was not back-filled after the UST removals. On September 17, 1993, TPE filed a UST Unauthorized Release (Leak)/ Contamination Site Report form on behalf of the property owner. The results were presented in TPE's December 29, 1993 *Tank Closure Report* and are summarized in Table 1.

November 1995 Piping Removal and Tank Pit Re-Sampling: On November 27, 1995, Cambria collected eight soil samples (S-2 though S-9) at depths of approximately 15 fbg from the open tank pit at the ends of the former USTs and six soil samples (TS-1 through TS-6) beneath the former product piping. Figure 2 shows the sample locations. TPHg was detected in all tank pit samples at concentrations ranging from 570 ppm to 5,600 ppm. Benzene was detected in the tank pit samples at concentrations ranging from <0.5 ppm to 72 ppm. TPHg was detected in two soil samples collected beneath former piping locations at concentrations of 46 ppm and 3,100 ppm, and benzene was detected at concentrations ranging from <0.005 ppm to 30 ppm (Table 1). The results were presented in Cambria's December 28, 1995 *Piping Removal Sampling and Tankpit Re-Sampling* report.

March 1996 Subsurface Investigation: On March 6 - 8, 1996, Cambria advanced 11 soil borings on site. Four borings were converted to groundwater monitoring wells (MW-1 through MW-4), two borings were converted to combined air-sparge and soil-vapor-extraction (SVE) wells (VW/AS-1 and VW/AS-3), and two borings were converted to combined SVE and groundwater monitoring wells (VW/MW-2 and VW/MW-4) (Figure 2). The remaining borings (SB-C, SB-E, and SB-J) were backfilled with neat cement. Selected soil samples were analyzed for TPHg, benzene, toluene, ethylbenzene and xylenes (BTEX), and oil and grease. The results were presented in Cambria's July 22, 1996 *Subsurface Investigation Report* and are summarized in Table 1. Groundwater sampling of the monitoring wells was performed on March 25, 1996.

Cumulative groundwater monitoring results are presented in a table prepared by Blaine Tech Services, Inc. (Blaine) of San Jose, California (Attachment D).

1997 Oxygen Releasing Compound (ORC) Installation: As agreed during a January 1997 meeting with ACHCSA, Cambria installed ORC "socks" in wells MW-1, VW/MW-2, and VW/MW-4 on March 25, 1997. The ORC socks were replaced periodically until September 21, 2000. On October 17, 2000, the ORC socks were removed permanently.

1997 to 2000 Activities: Shell, Cambria, and ACHCSA met on January 21, 1997 to discuss the site investigation and activities. Between March 1997 and October 2000, as agreed during the January 21, 1997 meeting and per subsequent communications with ACHCSA, in compliance with ACHCSA's requirements, Shell's contractors installed ORC "socks" and maintained them until October 2000. Also, as ACHCSA required, site groundwater was monitored and sampled quarterly, and Cambria submitted quarterly monitoring reports. Periodically, Cambria's reports also made additional recommendations and responded to agency requests. Cambria's May 15, 1997 *First Quarter Monitoring Report* recommended preparing a work plan for additional investigation. However, ACHCSA's case notes (obtained from an agency file review) indicate the caseworker "decided not to ask for more SWI" *(soil and water investigation)* "because the 7/23/96 rpt *(report)* included *(boring)* SBE (SB-E) to the N *(north)* and SBJ *(SB-J)* to the S *(south)* of MW1. They were low to ND conc *(concentrations)* for benz *(benzene)* in gw *(groundwater)* and ND in soil (although soil samples were below gw)."

Cambria's September 7, 1997 *Second Quarter Monitoring Report* noted that Cambria had discussed evaluating further groundwater investigation with ACHCSA on May 20, 1997, and requested that ACHCSA review the report's results and contact Cambria to discuss this recommendation further. Cambria's December 22, 1997 *Third Quarter Monitoring Report* again recommended evaluating further site investigation. ACHCSA's September 23, 1998 letter concurred with Cambria's recommendation to reduce the sampling of wells MW-2, MW-3, and MW-4 to semi-annual. ACHCSA's September 23, 1999 letter requested that the quarterly monitoring reports provide additional detail and that wells MW-1, VW/MW-2, and VW/MW-4 be sampled. ACHCSA's March 1, 2000 letter concurred with Cambria's recommendation that all site monitoring wells' elevation be resurveyed. As recommended, all wells were surveyed on March 8, 2000 by Virgil Chavez Land Surveying, and the revised well casing elevation data was used to calculate groundwater elevations in subsequent monitoring reports. Following a May 1, 2000 telephone conversation with Cambria regarding further downgradient investigation, ACHCSA's May 11, 2000 letter requested an SCM. On May 11, 2000, Cambria discussed the elevated benzene concentrations in well MW-1 and site closure requirements with ACHCSA.

October 2000 SVE Testing: On October 16, 2000, Cambria performed SVE testing to determine the feasibility of SVE as a remedial alternative at the site. Although groundwater interfered with

the SVE testing, Cambria concluded that SVE might be an effective method to remove hydrocarbons from soils above the groundwater table. However, subsequent investigations have detected little or no hydrocarbon impacts in soil samples collected above the range of water table fluctuations. Cambria's June 6, 2001 *Soil Vapor Extraction and Site Investigation Report* presented the SCM and results of the October 2000 SVE testing and the December 2000 Geoprobe® investigation, .

December 2000 Subsurface Investigation and SCM: On December 11, 2000, Cambria advanced five soil borings (GP-1 through GP-5) to depths ranging from 16 to 20.5 fbg (Figure 2). Soil samples were collected from each boring at 5-ft intervals, and groundwater samples were collected when groundwater was encountered. No TPHg, benzene, or methyl tertiary butyl ether (MTBE) was detected in any of the soil samples. TPHg was detected in groundwater samples from GP-1 and GP-3 at concentrations of 11 and 4,400 parts per billion (ppb), respectively. Benzene was detected in groundwater from GP-1 and GP-3 at concentrations of 11 and 4,400 ppb, respectively. MTBE was only detected in groundwater collected from boring GP-1 at 0.067 ppb (analyzed by EPA Method 8260). Along with October 2000 SVE testing results and the SCM, the Geoprobe® investigation results were presented in Cambria's June 6, 2001 *Soil Vapor Extraction and Site Investigation Report.* Table 1 presents soil analytical data, and Table 2 presents groundwater analytical data.

September 2001 Subsurface Investigation: On September 27, 2001, Cambria installed three monitoring wells (MW-5 through MW-7), each to a depth of 20 ft (Figure 2). Two soil samples were collected from the tank pit boring (MW-5) for chemical analysis. TPHg was detected at concentrations of 3.9 ppm and 790 ppm in soil at depths of 9.5 and 14.5 ft. Benzene was detected at a concentration of 2.7 ppm in soil at a depth of 14.5 ft (Table 1). Groundwater samples were collected from the new wells during the regularly scheduled quarterly monitoring event on December 6, 2001. TPHg was detected at concentrations of 31,000 ppb, 76 ppb, and 1,800 ppb in wells MW-5, MW-6, and MW-7, respectively. Benzene was detected at concentrations of 3,000 ppb, 5.7 ppb, and 390 ppb in the respective wells. No MTBE was detected in any soil or groundwater samples from the new wells. Cambria's November 2001 *Monitoring Well Installation Report* presented results.

March 2002 Well Survey: On March 22, 2002, Cambria submitted a *Well Survey* report which identified three potential receptor wells (one cathodic protection well, and two wells of unknown, presumably irrigation or industrial, use) within ½ mile of the site. Figure 1 shows the approximate well locations. The report concluded that due to either distance or location upgradient and cross gradient of the site, it is unlikely that any known well would be impacted by hydrocarbons originating from the site.

March 2002 RBCA Report: Cambria prepared a March 7, 2002 *Risk-Based Corrective Action (RBCA) Report,* based on the City of Oakland's ULR Program RBCA *Guidance Document* and using historical soil and groundwater data. The Tier 2 RBCA analysis considered BTEX as COCs. Benzene in groundwater was found to be the primary COC driving risks at this site. Based on the predominantly sand/sandy silt/silty-sand stratigraphy observed by Cambria in soil borings drilled at the site, Cambria used the "sandy silts" soil type option to select the appropriate Oakland SSTLs in this analysis. The results found that the representative soil and groundwater concentrations were below the applicable Oakland SSTLs. Based on the parameters used, Cambria concluded that the results showed residual hydrocarbons at this site would not pose a significant health risk to future on-site commercial occupants or off-site residential occupants. Cambria also concluded that hydrocarbon concentrations in groundwater were decreasing with time and distance from the former UST complex, indicating shrinkage of the groundwater plume due to natural attenuation. In a meeting between ACHCSA, Shell, and Cambria on May 6, 2002, ACHCSA expressed concern over the parameters used for the risk assessment, and requested that further investigation be conducted at the site.

July 2002 Door-to-Door Well Survey: On July 23, 2002, Cambria conducted a door-to-door well survey that included the residential block north-northeast (downgradient) of the site to determine whether there are any active water wells or basements in the survey area. A response to the survey was obtained from 23 of the 36 properties included in the survey. None of the respondents indicated the presence of a water well on the site, nine respondents reported that either a half or full basement was present at their dwelling, and one respondent noted a sump pump on the property. Cambria's August 26, 2002 *Subsurface Investigation Report and Corrective Action Plan* presented survey results.

June 2002 On-Site Subsurface Investigation: Between June 7 and June 10, 2002, Cambria advanced nine borings, (S-10 through S-18), in and near the former tank pit to further assess the extent of impacted soil in both the vadose and saturated zones onsite (Figure 2). Unsaturated soil samples collected at approximately 2.5-ft intervals and grab groundwater samples showed that the hydrocarbon impacts were limited to saturated soils and that the hydrocarbon plume in groundwater was relatively well-defined within an area approximately 10 ft to the west, 10 ft to the south, 15 ft to the east, and 30 ft to the north of the tank pit. Analytical results obtained from saturated soil samples indicated that hydrocarbon concentrations attenuated vertically to very low concentrations within 10 ft below the static groundwater level. Cambria submitted investigation results in the August 26, 2002 *Subsurface Investigation Report and Corrective Action Plan.* Tables 1 and 2 summarize analytical results.

July 2002 Off-Site Subsurface Investigation: On July 7, 2002, Cambria advanced four hand-auger borings (HA-1 through HA-4) on two adjacent off-site properties and collected grab-groundwater samples to further define the extent of impacted groundwater downgradient of the

site (Figure 2). No benzene was detected in any of the grab-groundwater samples collected from any of the off-site hand-auger borings at depths of 14 fbg (HA-1 and HA-2) and 16 fbg (HA-3 and HA-4). However, TPHg was detected at concentrations of 55 ppb and 85 ppb in hand-auger borings HA-1 and HA-2, respectively, on the property adjacent (east) of the site. Toluene was detected at a concentration of 0.77 ppb in HA-2 only, ethylbenzene was detected at a concentration of 0.52 ppb in HA-2 only, and xylenes were detected in borings HA-1 and HA-2 at concentrations of 1.2 and 2.8 ppb, respectively. Cambria submitted investigation results in the August 26, 2002 *Subsurface Investigation Report and Corrective Action Plan.* Tables 1 and 2 summarize analytical results.

August 2002 Subsurface Investigation Report (SIR) and Corrective Action Plan (CAP): In addition to presenting results of the June and July 2002 subsurface investigations noted above, Cambria prepared a CAP for the site in the August 2002 report. Cambria determined that the remedial objective for the site should be to reduce benzene concentrations in groundwater to levels considered protective of human health and the environment in the shortest time frame feasible. To meet this objective, Cambria recommended conducting a 5-day pilot test of in-situ oxidation using hydrogen peroxide (H_2O_2).

September 2002 SIR and CAP Addendum: To clarify concerns ACHCSA raised in its August 30, 2002 e-mail message, Cambria prepared the September 12, 2002 *Subsurface Investigation Report and Corrective Action Plan – Addendum.* In it, Cambria:

- Acknowledged that a 30-day public review comment period would be required prior to ACHCSA approval of the CAP. Cambria provided the names and addresses of the property owners and residents of the immediate neighboring homes and businesses;
- Confirmed the basis for concluding the non-existence of the well formerly located in DeFremery Park;
- Clarified the basis for the proposed cleanup goals;
- Summarized the results of evaluation of the potential remedial alternatives, including anticipated effectiveness of each alternative, anticipated costs and expected time for remediation and monitoring activities;
- Discussed its consideration of residual pollution effects in relation to decreasing water levels;
- Proposed a soil and groundwater verification monitoring plan
- Confirmed Cambria's belief that the proposed H_2O_2 injection work would not pose any risk to neighboring residents, and discussed the measures to prevent and monitor for any hazardous conditions, and
- Provided additional technical information to be made available to concerned citizens.

November 2002 SIR and CAP Addendum 2: To address concerns in ACHCSA's October 21, 2002 letter, Cambria submitted the November 2002 *Subsurface Investigation Report and Corrective Action Plan 2*. In it, Cambria:

- Provided assessor parcel numbers for neighboring properties;
- Confirmed the basis for concluding the non-existence of the well formerly located in DeFremery Park;
- Clarified and provided proposed cleanup levels and cleanup goals for soil and groundwater
- Discussed Cambria's use of TPHg data in the prior RBCA analysis and proposal of cleanup levels;
- Discussed Cambria's evaluation of all complete exposure pathways
- Provided a copy of the Oakland RBCA Eligibility Checklist as submitted with the March 7, 2002 report;
- Agreed to provide a soil grain size analysis from post-remediation soil samples to evaluate the selection of soil type used in the Oakland RBCA analysis;
- Discussed the evaluation of human health risk considering current and historic depths to water;
- Agreed to provide a post- remediation verification sampling plan, including sampling of soil and groundwater; and
- Agreed to post informational signs on the perimeter fence while remedial activities are in progress.

In a February 18, 2003 letter, ACHCSA approved the CAP and concurred with the proposed final cleanup levels. ACHCSA stated the cleanup goals would be the Water Quality Objectives established in the Regional Water Quality Control Board's Basin Plan. Table 3 summarizes the final cleanup goals and levels. In addition, ACHCSA requested that additional work be performed to evaluate the concerns of Mr. Matthew Willingham, owner of the property at 1418-1420 Union Street, including location of all utilities and the evaluation of risk of volatilization to indoor air and residential exposure.

Groundwater Extraction (GWE) and Dual Phase Vapor Extraction (DVE): Beginning on June 11, 2002, Cambria conducted semi-monthly mobile GWE using well MW-5 in an attempt to reduce hydrocarbon concentrations in groundwater in the suspected source area. Cambria changed semi-monthly mobile GWE to semi-monthly mobile DVE beginning on September 19, 2002. DVE was discontinued on March 4, 2003 prior to the start of hydrogen peroxide injection pilot testing. Monthly DVE was re-instated between November 10, 2003 and April 28, 2004. GWE and DVE have removed approximately 5.5 pounds of dissolved-phase hydrocarbons and 5.6 pounds of vapor-phase hydrocarbons from the subsurface. Table 4 summarizes GWE analytical data, and Table 5 summarizes vapor analytical data.

2003 H_2O_2 Injection Remediation: After receiving ACHCSA's concurrence with the final CAP recommendations, Cambria directed implementation of H_2O_2 injection on March 17 through 20, 2003. Approximately 3,521 gallons of 15 % H_2O_2, 9.5 gallons of sulfuric acid (H_2SO_4), and 60 gallons of water were injected into 16 locations (A-1, A-3, A-6, A-8, C-4, C-6, C-7, D-3, D-4, E-6, F-2, F-7, G-1, G-4, G-6, and G-8) (Figure 4) at depths ranging from 19.5 to 3.5 fbg. Blaine conducted baseline groundwater sampling immediately prior to the H_2O_2 injection on March 13, 2003, and conducted monthly post-injection groundwater monitoring on April 23, 2003, May 13, 2003, June 13, 2003, and July 14, 2003.

After reviewing the post-remediation groundwater monitoring results, Cambria directed a repeated H_2O_2 injection event from September 22 through 24, 2003. Approximately 805 gallons of 15% to 22% H_2O_2 solution, 128 gallons of H_2SO_4 solution, and 15 gallons of water were injected into 12 3/4-inch temporary injection wells (P-1 through P-12) at depths ranging from 7 to 22 fbg (Figure 4).

Following review of post-injection groundwater monitoring results, and noting increased concentrations in some wells, Cambria directed monthly DVE from well MW-5. Monthly DVE was re-initiated on November 10, 2003, and continued until April 28, 2004. During the DVE events following H_2O_2 injections, an estimated 0.45 lbs of TPHg and 0.08 lbs benzene were removed in the liquid phase, and an estimated 1.51 lbs of TPHg and 0.02 lbs benzene were removed in the vapor phase. Summaries of liquid and vapor-phase mass removals by GWE and DVE are included in Tables 4 and 5.

To evaluate the H_2O_2 injection's effectiveness, Cambria directed the installation of four verification soil borings (S-18 though S-21) to 25 fbg, to collect soil and grab groundwater samples from three locations within the treated UST backfill area and from one on-site, downgradient location. Soil samples were collected at approximately 5.0 ft intervals from each boring. Grab groundwater samples were collected using a bailer from each open boring.

Temporary injection wells P-1 through P-12 were destroyed on January 11, 2005. Quarterly groundwater monitoring continued. Cambria's March 17, 2005 *Remediation, Verification Sampling, and Post-Remediation Monitoring Report* reported the remediation activities, and evaluated the H_2O_2 injection's effectiveness.

Groundwater Monitoring: Regular groundwater monitoring has been conducted at the site since March 25, 1996. Cumulative groundwater monitoring results through January 2005 are presented in Blaine's table included as Attachment D.

Site Conditions

Sediment Lithology: Previous site investigations indicated that subsurface materials encountered consist primarily of silty sand, silty gravel, and sand to the total explored depth of 30 ft. The upper 9 to 10 ft of the filled former tank pit area consists of gravelly sand fill material.

United States Geological Survey (USGS) publications and maps indicate that the area is underlain by the Merritt Sand (*Areal and Engineering Geology of the Oakland West Quadrangle, California,* D.H. Radbruch, USGS, *Miscellaneous Geological Investigations, Map I-239,* 1957, and *Geologic Map and Map Database of the Oakland Metropolitan Area, Alameda, Contra Costa, and San Francisco Counties, California,* USGS R.W. Graymer, 2000) (Attachment E).

As discussed above, on March 18, 2005, Cambria advanced three soil borings (GS-01 through GS-03) (Figure 3), to collect soil samples from 5 fbg and 8 fbg at each location. The soil samples were submitted for grain size analysis, and the results indicated that the native soil type is silty to very silty sand. This is consistent with the description of the Merritt Sand formation.

Groundwater Depth and Flow Direction: Recorded groundwater depths beneath the site have ranged from 4.8 to 13.9 fbg. The shallowest groundwater elevations since monitoring began were observed in February and June 1998 and in March 2000. The long-term average depth to groundwater is 11.36 fbg. The groundwater flow direction, as calculated from depth-to-water measurements in on-site monitoring wells, is typically to the northeast. Figure 5 shows the historical fluctuations of the depth to groundwater and the average depth to groundwater.

Current Hydrocarbon Distribution in Soil: The Oakland RBCA ULR RBCA *Guidance Document* defines "surficial soils" as the "top one meter (3.28 ft) of soil", and "subsurface soil" as "all soil deeper than one meter and above groundwater".

Surficial Soils: Soil samples were collected near the former dispensers and piping locations from surficial soils in 1993 (DS-1 through DS-6), in the same approximate locations in 1995 (TS-1 through TS-6), and from one angle-boring (SB-18) near the location of DS-6 and TS-6 in 2002. Since natural degradation processes in the surficial soils are occurring, the current soil conditions are best represented by the most recent data. For this evaluation, Cambria considers the 1995 soil samples TS-2 through TS-5 and the 2002 soil sample SB-18 to represent the most current shallow soil hydrocarbon concentrations. Table 6 summarizes the five representative surficial soil sample analytical results. Figures 6, 7, 8, and 9 present updated soil cross sections with TPHg and benzene analytical data. Most surface soil sample results were below detection limits for most target analytes; however, for the purpose of determining representative concentrations for use in the risk assessment, the value of the non-detected results are conservatively assumed to be equal to their detection limits. Since only five samples are included in this data set, the maximum

detected concentrations were used to conservatively represent the surficial soil concentrations, rather than using an "averaged" concentration. The resulting representative soil concentrations are: 46 ppm TPHg, 0.10 ppm benzene, 0.10 ppm toluene, 0.10 ppm ethylbenzene, and 2 ppm total xylenes.

Subsurface Soils: Since soil samples have been collected above and below the water table at various times, for risk assessment it is necessary to specify which sample depths represent unsaturated soils and which represent saturated soils. In 9 out of the 10 past annual seasonal groundwater elevation cycles, the groundwater table has risen to levels shallower than 10 fbg. The average depth to groundwater recorded since 1996 was 11.36 fbg. Therefore, for the purpose of defining the water table depth for risk assessment use, Cambria believes that soil analytical data from samples above 11.36 fbg accurately represent unsaturated soils, and should comprise the subsurface soils data set. Cambria believes data from samples collected below 11.36 fbg are from saturated soils, and should be excluded from the subsurface soils data set. Figures 6, 7, 8, and 9 present updated soil cross sections with TPHg and benzene analytical data, and illustrate the average depth of groundwater.

Soil sampling in 2002 (S-10 through S-17) re-sampled the former UST pit area before remediation, and 2003 soil samples (S-18 through S-21) sampled the former UST pit and other areas after remediation. Because the results were very similar, Cambria considers these samples to be most representative of current subsurface soil conditions. Also, samples were not later collected near the 2001 MW-5 soil sample, so the MW-5 soil data will also be included. The 2000 Geoprobe® investigation was conducted at the site perimeter, outside the remediation treatment area; thus, those sample results are considered still representative of current subsurface soil conditions. In the absence of more current soil data, the 1996 soil samples collected from well installations above 11.36 fbg (VW/AS-1, VW/MW-2, VW/AS-3, and VW/MW-4) and the 1995 piping sample TS-1-4.0 are also considered representative of current subsurface soil conditions. The 1993 waste oil tank soil sample S-1 is considered representative since no subsequent sampling has occurred near that location. The 1991 soil borings SB-1 through SB-3 and 1993 samples VSW-1 and VSW-2 are not considered current, since subsequent soil data has been collected later at nearby locations.

The resultant subsurface soil data set includes 55 soil sample data points; Table 7 summarizes this data. Most sample results were below detection limits for most target analytes; however, for the purpose of determining representative concentrations for use in the risk assessment, the value of the non-detected results are conservatively assumed to be equal to their detection limits. Since 55 samples are included in this data set and their concentrations vary widely, statistically determined representative values, the 95% upper confidence limit (95% UCL) of the mean concentration of each COC, can be calculated from the data set and used as conservative estimates of the source

concentrations. Cambria used the United States Environmental Protection Agency (US EPA) software program *ProUCL* version 3.00.02 (EPA/600/R04/079, April 2004) to calculate 95% UCL values from the data set. Printouts from *ProUCL* documenting the calculations are included as Attachment F. Table 7 also presents the 95% UCL of the mean concentration for each COC for subsurface soil. The resulting representative subsurface soil concentrations are: 201.08 ppm TPHg, 0.57 ppm benzene, 4.73 ppm toluene, 2.95 ppm ethylbenzene, and 30.44 ppm total xylenes.

Current Hydrocarbon Distribution in Groundwater: Previous site investigation data and quarterly groundwater monitoring results indicated that the hydrocarbon plume is defined by nearly non-detectable concentrations around the site perimeter. Hydrocarbons are not typically detected in monitoring wells MW-2, MW-3, and MW-4. Currently, the highest benzene concentrations are detected in monitoring wells in and adjacent to the former UST pit.

Groundwater monitoring data collected since 1996 indicate that hydrocarbon concentrations decrease with time and with distance from the tank pit. Figure 10 shows the decreasing benzene concentration trend in MW-1, located downgradient of the tank pit. As shown on Figure 11, benzene concentrations in wells VW/AS-3 (located between the tank complex and dispenser islands) and VW/AS-1 (located between the tank complex and MW-1) are also decreasing with time. The decrease in benzene concentration with distance from the tank complex is illustrated in Figure 12, which shows the most recently available data for MW-5 (located in the former tank pit), VW/AS-1 (located slightly downgradient of the former tank pit), MW-1 (located downgradient of the former tank pit), and MW-7 (located near the downgradient boundary of the site).

During the August 2002 investigation, no benzene was detected in any of the grab-groundwater samples collected from any of the off-site hand-auger borings. However, TPHg, toluene, ethylbenzene, and xylenes were detected at maximum concentrations of 83 ppb, 0.77 ppb, 0.52 ppb, and 2.8 ppb, respectively, on the property adjacent (east) of the site. Cambria believes these values can conservatively be considered the representative off-site groundwater concentrations. These off-site groundwater concentrations are below the approved CAP's cleanup levels and cleanup goals.

To determine representative, on-site, post-remediation groundwater concentrations, the results from the seven most recent groundwater monitoring events (all conducted after the final H_2O_2 injection event) from all wells were tabulated, and the 95% UCL of the mean concentration for each COC were calculated from the 77 data points using the US EPA software program *ProUCL* version 3.00.02. Printouts from *ProUCL* documenting the calculations are included in Attachment F. Table 8 presents the 95% UCL of the mean concentration for each chemical of concern for groundwater. The resulting representative groundwater concentrations are:

1,168 ppb TPHg, 799 ppb benzene, 1,960 ppb toluene, 156 ppb ethylbenzene, and 1,113 ppb total xylenes.

Below, Cambria updates the SCM with the latest available data.

Item	Evaluation Criteria	Comments/Discussion
1	**Hydrocarbon Source**	
1.1	Identify and Describe Release Source and Volume (if known)	A service station operated at the subject site from 1958 until 1993. Three soil borings (SB-1, SB-2, and SB-3) were drilled on the subject site in 1991. Data from these and subsequent borings drilled on the subject site indicate that petroleum hydrocarbons are present primarily in soils below water table in the vicinity of the former USTs. No records regarding a specific release or source or volume are available. Historical soil data are presented in Table 1.
1.2	Discuss Steps Taken to Stop Release	In 1993, three 7,500-gallon single-walled steel gasoline USTs, one 8,000-gallon single-walled steel gasoline UST, one 550-gallon single-walled steel waste oil UST, and two product dispensing islands were removed. Overexcavation of the gasoline UST and waste-oil UST pit was performed.
2	**Site Characterization**	
2.1	Current Site Use/Status	The site is located at the northeast corner of the intersection of 14th Street and Union Street in Oakland (Figure 1) in an area of mixed residential/commercial land use. The former station building is abandoned, and the site perimeter is fenced. The site is otherwise vacant and unused (Figure 2).
2.2	Soil Definition Status	Surficial soil sample results indicated that the highest hydrocarbon concentrations in soils 3.0 ft or less were located in November 1995 near the eastern end of the southern dispenser island (sample TS-6); however, subsequent sampling in location VW/MW-4 (March 1996) and SB-18 (June 2002) indicated soil concentrations were much lower and were not widespread. Surface soils are not considered to be significantly impacted. The maximum surface soil concentrations of 46 ppm TPHg and 0.1 ppm benzene are conservatively considered the representative surface soil concentrations. The extent of hydrocarbon impacts in subsurface soils, from below 3.0 fbg to the water table at approximately 11.36 fbg, has been defined. The soil samples with the highest concentrations are at depths within the range of groundwater table fluctuations, in the area of the former USTs. Therefore, the reported soil concentrations are indicative of fuel impact to groundwater and saturated soils, and are not be representative of unsaturated soil conditions. The maximum current subsurface soil concentrations of TPHg and benzene are 1,800 ppm and 4.0 ppm, respectively, in boring SB-18 at 9.0 fbg, sampled in November 2003. The representative 95% UCL of the

Item	Evaluation Criteria	Comments/Discussion
		mean concentrations of TPHg and benzene are 201.08 ppm and 0.57 ppm, respectively. Based on the soil analytical data, TPHg and benzene are defined laterally in all directions by borings GP-1 though GP-5, and by borings for MW-2, MW-3, MW-4, MW-6 and MW-7. Hydrocarbons in the oil and grease and diesel ranges have also been reported in soils at the site, near the former waste oil tank. Sample S-1 from 8.5 fbg in 1993 contained 7,700 ppm oil and grease and 1,200 ppm TPHd. Saturated soil samples from borings SB-E and MW-1 in 1996 indicated the presence of up to 200 ppm oil and grease. Historical soil data are presented in Table 1.
2.3	Separate-Phase Hydrocarbon (SPH) Definition Status	SPH has not been observed at the site.
2.4	Groundwater Definition Status (TPHg/BTEX)	Quarterly groundwater monitoring began at the site in the first quarter 1996. The highest TPHg and BTEX concentrations detected in on-site wells have been from wells MW-5 and VW/MW-4. Petroleum hydrocarbons are defined in groundwater to the east by non-detect concentrations in well MW-6, to the north by MW-7, to the west by MW-4, and to the south by MW-2. Additional on-site grab groundwater samples from borings GP-2, GP-4 and GP-5, and by off-site borings HA-1 though HA-4 provide additional groundwater definition of the non-detect concentrations. The post-remediation representative 95% UCL concentrations of TPHg and benzene in groundwater are 1,168 ppb and 799 ppb, respectively. Grab groundwater data from borings is presented in Table 2. Groundwater monitoring data are summarized in Attachment D.
2.5	TPHg/BTEX Plume Stability and Concentration Trends	Groundwater data from on-site wells and off-site borings indicate that TPHg and BTEX concentrations are decreasing, the plume has not migrated off-site, and it is stable. The groundwater concentrations have been observed to fluctuate seasonally prior to any remediation. Hydrogen peroxide injection in March and September 2003 upset the overall concentration trends, but as of first quarter 2005, decreasing trends appear to have recovered.
2.6	Groundwater Definition Status (Oxygenates)	Fuel oxygenates have not been detected at high concentration at this site, thus they are not among the constituents of concern at the site. Soil samples are no longer analyzed for MTBE or fuel

Item	Evaluation Criteria	Comments/Discussion
		oxygenates for the reasons outlined above. Groundwater monitoring includes MTBE analysis; however, the results are generally below detection limits.
2.7	Oxygenate Plume Stability and Concentration Trends	No oxygenate plume is present.
2.8	Groundwater Flow Direction, Depth Trends and Gradient	Groundwater depth beneath the site has ranged from 4.8 to 13.9 fbg. The long term average depth to water is 11.36 fbg. Groundwater depths are presented on the groundwater monitoring data table (Attachment D). The groundwater flow direction is consistently toward the north and northeast at an approximate hydraulic gradient of 0.002. The fourth quarter 2004 groundwater contour map is included as Figure 13.
2.9	Stratigraphy and Hydrogeology	Subsurface materials encountered consist primarily of silty sand, silty gravel, and sand to the total explored depth of 22.5 ft. USGS maps indicated the site is underlain by the Merritt Sands (Radbruch 1957, and Graymer 2000). In March 2005, soil samples from three borings were analyzed for grain size distribution. The grain size analysis results indicated the native soil type was silty to very silty sand, consistent with the Merritt Sands.
2.10	Preferential Pathways Analysis	There are no known underground utilities which intersect impacted soil and groundwater. Because the extent of impacted groundwater is defined on site, no external preferential pathways are affecting the site.
2.11	Other Pertinent Issues	Fuel oxygenates not among the constituents of concern at the site because they have not been detected at levels warranting action.
3	**Remediation Status**	
3.1	Remedial Actions Taken	Shell has conducted remediation at the site. In 1993, three 7,500-gallon gasoline USTs, one 8,000-gallon gasoline UST, and one 550-gallon waste oil UST were removed from the site. A total of approximately 334 cubic yards of impacted soil were excavated following the UST removal. ORCs were installed in wells MW-1, VM/MW-2, and VW/MW-4 from March 1997 until October 2000 to enhance naturally occurring hydrocarbon degradation. An SVE pilot test was performed in October 2000. Mobile GWE and DPE by vacuum truck were performed between June 2002 and March 2003. Two hydrogen peroxide injection events were conducted in March 2003 and September 2003 to remediate groundwater and saturated soils in the former UST pit areas. Monthly DVE was re-initiated on November 10, 2003, and continued until April 28, 2004.
3.2	Area Remediated	Remediation has occurred in the area of the former UST pit. Sixteen locations in the UST pit area were injected with hydrogen peroxide in March 2003. Twelve temporary probes were used in September 2003 to inject hydrogen peroxide into the former UST pit. Well MW-5

Item	Evaluation Criteria	Comments/Discussion
		was used as the GWE and DPE well.
3.3	Remediation Effectiveness	GWE and DVE removed approximately 5.5 pounds of dissolved-phase hydrocarbons and 5.6 pounds of vapor-phase hydrocarbons prior to the hydrogen peroxide injections. Following the injections, DVE removed 0.45 lbs of TPHg and 0.08 lbs benzene in the liquid phase, and an estimated 1.51 lbs of TPHg and 0.02 lbs benzene the vapor phase. Tables 4 and 5 presents the DPE data summaries. Hydrogen peroxide injection effectiveness was discussed in Cambria's March 17, 2005 *Remediation, Verification Sampling, and Post-Remediation Monitoring* report.
4	**Well and Sensitive Receptor Survey**	
4.1	Designated Beneficial Water Use	Site is located within the Oakland Sub-Area of the East Bay Plain groundwater basin. Existing and potential beneficial uses include municipal and domestic water supply, agricultural supply, industrial service supply, and industrial process supply (SF RWQCB Basin Plan). The basin plan notes that no drinking water wells are known; however, numerous backyard irrigation wells exist in this groundwater basin.
4.2	Well Survey Results	Cambria's 2002 well survey identified 3 potential receptor wells (1 cathodic protection, and 2 of unknown use) within ½ mile of the site (Figure 1). None of the unknown use wells could be confirmed. The reported well at DeFremery Park was investigated by interviewing City of Oakland personnel familiar with the site, and no one has any knowledge of the well. Thus, it was concluded to be permanently out of service and not a potential receptor. A door to door residential well survey was conducted in 2002, and 23 responses were received from the 36 addresses queried. No wells were reported by the respondents.
4.3	Likelihood of Impact to Wells	Since fuel impacts to groundwater are limited to the site, and since there are no known receptor wells, there is no likelihood of impact to off-site receptor wells.
4.4	Likelihood of Impact to Surface Water	No surface water was identified within a ½-mile radius of the site. No potential impact is possible since fuel impacts to groundwater are limited to the site. The closest surface water body, San Francisco Bay, lies 2 miles south of the site.
5	**Risk Assessment**	
5.1	Site Conceptual Exposure Model (current and future uses)	The site is currently a vacant lot bordered by residential properties on the north and east. Across Union Street and 14th Street are commercial properties. Future site use is expected to be commercial, although the site is zoned for residential land use. The RBCA risk assessment includes commercial and residential land use scenarios.
5.2	Exposure Pathways	Potential exposure pathways may include on-site and off-site inhalation of vapors in indoor and outdoor air from

Item	Evaluation Criteria	Comments/Discussion
		soil and groundwater. Construction workers may be exposed to residual hydrocarbons in surface soils. Since no water-producing wells are known in the area, exposure to groundwater by ingestion in not a complete exposure pathway. An exposure pathway flowchart is included as Figure 14.
5.3	Risk Assessment Status	In 2002, Cambria performed a Tier 2 RBCA analysis to compare site conditions to City of Oakland SSTLs using "sandy silts" soil type based on soil types encountered at the site. The representative soil and groundwater benzene concentrations did not exceed the SSTLs determined for soil and groundwater in that analysis. Below, Cambria updates the RBCA risk assessment with current data, using the Merritt Sands soil type. The revised RBCA analysis is presented below.
5.4	Protective Target Risk Levels	Per the Oakland ULR RBCA guidance, for a Tier 2 analysis, 10^{-5} is the recommended target risk level for carcinogens. For non-carcinogens, a Hazard Quotient of 1.0 is the recommend target level.
5.5	Identified Human Risk Exceedances	Representative benzene concentrations did not exceed the SSTLs determined by the Oakland RBCA guidance document for any exposure pathway or receptor.
5.6	Identified Ecological Exceedances	No ecological receptors have been identified.
6	**Additional Recommended Data or Tasks**	
6.1	Update RBCA	Cambria recommended updating the 2002 RBCA with current data and using the Merritt Sands soil type to evaluate potential, post-remediation risks. This is presented below.
6.2	Collect soil samples for grain size analysis to confirm soil type	In March 2005, Cambria advanced three borings to collect soil samples for grain size analysis to confirm the appropriateness of the Merritt Sands soil type. The results indicated the soil type is silty to very silty sand, consistent with the Merritt Sands.
6.3	Continued Groundwater Monitoring	Review of groundwater concentration trends indicates COC concentrations are decreasing. However, pending agency approval of case closure, continued groundwater monitoring is warranted on a reduced frequency.

REVISED TIER 2 RISK ANALYSIS USING OAKLAND ULR RBCA GUIDANCE

To determine if the site's post remediation conditions meet acceptable cleanup levels, Cambria conducted a RBCA analysis following the guidelines set forth by the City of Oakland Public Works Department ULR Program in their January 1, 2000 *Guidance Document*. The *Guidance Document*'s risk assessment approach is consistent with the American Society for Testing and Materials (ASTM) standard E-1739 "*Standard Guide for Risk-Based Corrective Action Applied*

at Petroleum Release Sites", and is consistent with the general US EPA and Cal-EPA risk assessment guidance, and with San Francisco Bay Regional Water Quality Control Board's (SF RWQCB) environmental screening level (ESL) guidance. Below, Cambria presents an SCM for the risk assessment and the results of the RBCA analysis.

SCM for Risk Assessment

The SCM describes the relationship between the impacted media and receptors that may be exposed to chemical constituents originating from the site. Cambria developed the SCM for the site based on review of all available geological and analytical data and on evaluation of potential transport and exposure pathways. Specifically, the following information is included in the SCM: (a) impacted media, (b) representative COC concentrations, (c) potentially exposed receptors and exposure pathways, and (d) protective target risk levels.

Impacted Media: Historical analytical data indicate that subsurface soil (>3 fbg) and groundwater beneath the site are impacted by petroleum hydrocarbons. Surficial soils (<3 fbg) are generally not significantly impacted, but there have been some hydrocarbon constituents detected in shallow soils.

COCs: COCs in soil and groundwater at the site include benzene, toluene, ethylbenzene, and total xylenes. TPHg is present in soil and groundwater at the site. The Oakland ULR *Guidance Document* does not specifically address TPHg; however, the current SF RWQCB ESLs guidance includes ESLs for TPHg. At ACHCSA's request, Shell included TPHg as a COC. MTBE has not been detected at significant concentrations at the site, and is not considered a COC.

Cleanup Levels and Cleanup Goals: ACHCSA required that cleanup levels and goals be specified before approving the 2002 CAP and subsequent addendums. In addition, ACHCSA required that Cambria propose cleanup levels and goals for TPHg. For BTEX compounds, the soil and groundwater cleanup level, and soil cleanup goal were set equal to the Oakland ULR RBCA Tier 2 SSTLs for Merritt Sands. The groundwater cleanup goal for BTEX was set to the SF RWQCB Water Quality Objectives for Municipal Supply per the 1995 Basin Plan. The TPHg cleanup levels and goals for soil and groundwater were set equal to the SF RWQCB RBSLs for soil and groundwater for commercial land use, where groundwater is not considered a drinking water source. The final cleanup levels and goals are summarized in Table 3.

Representative COC Concentrations: The COCs are BTEX and TPHg. The impacted media are surficial soils, subsurface soils, and groundwater. For each media, Cambria developed representative concentrations for each COC from the most recent available representative sample data, as described above.

Surficial Soils (<3 ft fbg): Due to the small number of surface soil samples, the representative soil concentrations were taken as the maximum detected concentrations from the most recent representative samples. The representative concentrations are: 46 ppm TPHg, 0.10 ppm benzene, 0.10 ppm toluene, 0.10 ppm ethylbenzene, and 2 ppm total xylenes. Table 6 presents the data used to develop the representative surficial soil concentrations.

Subsurface Soils (> 3 fbg and above groundwater): Representative soil concentrations (95% UCL of the mean concentrations) were calculated using *ProUCL* from 55 soil samples collected above 11.36 fbg. The representative subsurface soil concentrations are: 201.08 ppm TPHg, 0.57 ppm benzene, 4.73 ppm toluene, 2.95 ppm ethylbenzene, and 30.44 ppm total xylenes. Table 7 presents data used to develop the representative subsurface soil concentrations.

Groundwater: The representative groundwater concentrations (95% UCL of the mean concentrations) were calculated using *ProUCL* from 77 groundwater samples collected after completion of the hydrogen peroxide injections. The resulting representative groundwater concentrations are: 1,168 ppb TPHg, 799 ppb benzene, 1,960 ppb toluene, 156 ppb ethylbenzene, and 1,113 ppb total xylenes. Table 8 presents the data used to develop the representative groundwater concentrations.

Potentially Exposed Receptors and Exposure Pathways: The former service station is currently vacant and the building is abandoned. The site is bordered by residential property to the north and east, and across Union Street and 14th Street are commercial properties. Although the site is currently used for commercial land use, the property is zoned for residential land use. As a result, the RBCA analysis will include both potential future residents and commercial occupants as potential exposed receptors, both on and off site.

Receptors may be exposed to the COCs by the following exposure pathways: COCs may volatilize from the impacted underlying soil and groundwater, and migrate to indoor and outdoor air. Although surficial soils are not highly impacted, receptors may also be exposed to COCs by dermal contact with surficial soils. If future construction were performed on site, there is potential for dermal exposure to and inhalation and ingestion of hydrocarbon-impacted soil, and inhalation of hydrocarbon vapors from soil or groundwater. Off-site receptors are unlikely to have dermal exposure, given the lack of any significant shallow soil impacts. Shallow and deep, on-site and off-site groundwater is not currently known to be used for any purpose. Cambria's prior well survey and door-to-door well survey established that no water-producing wells could extract impacted groundwater from the site.

Figure 14 depicts all of the potential exposure pathways and receptors and indicates those pathways considered complete.

Protective Target Risk Levels: Consistent with the Oakland ULR RBCA *Guidance Document,* a target carcinogenic risk level of $1x10^{-5}$ is used as the Tier 2 target risk level. The target non-carcinogenic risk level is a hazard quotient (HQ) of 1.0 per the Oakland ULR RBCA *Guidance Document.*

Soil Parameters: Oakland's RBCA guidance provides "soil-specific transport parameter" values that reflect characteristics of three predominant soil types found in Oakland. SSTLs are calculated using parameter values established for the particular soil types. The three soil types identified by Oakland are Merritt Sands, sandy silts and clayey silts. Based on the predominantly observed soil types at the site, on the USGS geological map of the area showing the site is underlain by Merritt Sands (Attachment E), and the results of the March 2005 soil grain size analysis, Cambria used the "Merritt Sands" soil type in the analysis.

Table A - CSM Summary for Risk Assessment

Item	Selected Value	Comment
Impacted Media	Surficial Soil, Subsurface Soil and Groundwater	Petroleum hydrocarbons have been detected in soil and groundwater beneath the site.
Chemicals of Concern (COCs)	BTEX, TPHg	TPHg was included at the request of ACHCSA.
Representative Concentrations for Surficial Soil	**Surficial Soil Concentrations (mg/kg or ppm)** • Benzene 0.10 • Toluene 0.10 • Ethylbenzene 0.10 • Xylenes 2.0 • TPHg 46	Highest COC concentrations detected in most recent soil samples (Table 6).
Representative Concentrations for Subsurface Soil	**Subsurface Soil Concentrations (mg/kg or ppm)** • Benzene 0.57 • Toluene 4.73 • Ethylbenzene 2.95 • Xylenes 30.44 • TPHg 201.08	95% UCL of mean COC concentrations detected in recent soil samples (Table 7)
Representative Concentrations for Groundwater	**Groundwater Concentrations (µg/L or ppb)** • Benzene 798.77 • Toluene 1,960.35 • Ethylbenzene 155.75 • Xylenes 1,113.20 • TPHg 1,167.54	95% UCL of mean COC concentrations detected in groundwater samples during the last seven quarterly monitoring events (Table 8).
Target Carcinogenic Risk Level	$1x10^{-5}$	Consistent with Oakland ULR RBCA *Guidance Document.*

Non-Carcinogenic Hazard Quotient	1.0	Consistent with Oakland ULR RBCA *Guidance Document.*

BTEX = Benzene, toluene, ethylbenzene, and xylenes
TPHg = Total petroleum hydrocarbons as gasoline
ppm = Parts per million
UCL = Upper confidence level
ppb = Parts per billion

Tier 2 Analysis

The final step in the Tier 2 analysis was to evaluate the exposure scenarios by comparing the calculated representative concentrations to Oakland's "Merritt Sands" SSTLs. The condensed Oakland ULR Tier 2 RBCA Merritt Sands spreadsheet showing the SSTLs for BTEX is included as Table 9. The SSTL values for all exposure pathways are included in Table 9, although not all exposure pathways are considered complete. Cambria made no other modifications to the default values in the Oakland ULR RBCA spreadsheets.

Cambria also completed the Oakland RBCA Cover Sheet, Eligibility Checklist, and Exposure Assessment Worksheet. Copies of these, and the Oakland RBCA default Merritt Sands input parameters and chemical parameters are included in Attachment G.

Cambria compared the representative concentrations for each soil and groundwater medium to the lowest applicable SSTL for the exposure pathways applicable to each medium. Results of our Tier 2 analyses for surficial soil, subsurface soil, and groundwater are summarized in Tables B, C, and D, below.

Table B – SSTLs for Surficial Soil (Merritt Sands)

ESL

COC	Applicable SSTL (ppm)	Representative Concentration (ppm)	SSTL exceeded?
Benzene	37 (res.) 150 (com./ind.)	0.10	No No
Toluene	11,000 (res.) 94,000 (com./ind/)	0.10	No No
Ethylbenzene	6,300 (res.) 63,000 (com./ind/)	0.10	No No
Xylenes	60,000 (res.) 380,000 (com./ind/)	2.0	No No
TPHg	400 (Commercial ESL)	46	No

COC = Chemical of concern
SSTL = Site specific target level
ppm = Parts per million
ESL = SF RWQCB Environmental Screening Level

Table C – SSTLs for Subsurface Soils (Merritt Sands)

COC	Applicable SSTL (ppm)	Representative Concentration (ppm)	SSTL exceeded?
Benzene	0.70 (res.) 11 (com./ind.)	0.57	No No
Toluene	370 (res.) SAT (com./ind.)	9.36	No No
Ethylbenzene	SAT (res.) SAT (com./ind.)	5.64	No No
Xylenes	SAT (res.) SAT (com./ind.)	40.22	No No
TPHg	400 (Commercial 100 ESL) Res	201.08	No (ESL)

COC = Chemical of concern
SSTL = Site specific target level
ppm = Parts per million
SAT = RBSL exceeds saturated soil concentration of chemical
ESL = SF RWQCB Environmental Screening Level

Table D – SSTLs for Groundwater (Merritt Sands)

COC	Applicable SSTL (ppb)	Representative Concentration (ppb)	SSTL exceeded?
Benzene	1,400 (res.) 22,000 (com./ind.)	798.77	No No
Toluene	280,000 (res.) >SOL (com./ind.)	1,960.35	No No
Ethylbenzene	>SOL (res.) >SOL (com./ind.)	155.75	No No
Xylenes	>SOL (res.) >SOL (com./ind.)	1,113.20	No No
TPHg	500 (GW ESL for non-drinking water)	1,167.54	Yes (ESL)

COC = Chemical of concern
SSTL = Site specific target level
ppb = Parts per billion
>SOL = RBSL exceeds solubility of chemical in water
ESL = SF RWQCB Environmental Screening Level

The representative BTEX concentrations do not exceed any of the residential or commercial/industrial SSTLs for surficial soil, subsurface soil, or groundwater. The

representative concentration for TPHg in surficial and subsurface soil does not exceed the ESL. However, the representative concentration for TPHg in groundwater exceeds the SF RWQCB ESL for TPHg, the cleanup level and cleanup goal set as required by the ACHCSA.

TPHg

The groundwater cleanup level and cleanup goal for TPHg that ACHCSA approved was 500 ppb. The cleanup level and goal was not based upon health-based criteria. It was based upon the SF RWQCB RBSL (RBSL Tier 1 Lookup Table D, Interim Final December 2001). The RBSLs have been updated and replaced by ESLs, and the value of the appropriate TPHg RBSL/ESL has not changed. However, as noted in the tables, the groundwater RBSL/ESL does assume potential discharge of groundwater into a marine or estuary surface water system. Although site groundwater does ultimately discharge to San Francisco Bay, there is no indication that hydrocarbon-impacted groundwater above the RBSL/ESL is leaving the site.

A Water Quality Objective for TPHg for municipal water supply beneficial use (MUN), is not identified in the June 1995 Basin Plan. MUN is the specified beneficial use of groundwater in the area of the site; the area around the site is not included in that area of Merritt sands near the Oakland and Alameda shorelines that have been proposed for MUN de-designation by the SF RWQCB in proposed Basin Plan revisions. However, as documented above, Cambria believes that it is very unlikely that groundwater in the area will be used for domestic or municipal water supply. Prior well surveys have shown that no water-producing wells are known in the area potentially affected by the dissolved hydrocarbons at or near the site.

Cambria believes that groundwater investigation and monitoring has shown that the TPHg plume is stable and decreasing and that intrinsic biodegradation will continue to reduce the remaining, limited mass of TPHg in groundwater. Off-site groundwater already meets the MUN water quality objectives for BTEX compounds. Although the current maximum and overall representative concentrations of TPHg in on-site groundwater exceed the RBSL/ESL, Cambria believes that decreasing concentration trends show that the RBSL/ESL objectives will be achieved on-site at the site within a few years. Cambria believes this is a reasonable period of time.

Although a specific TPHg MUN water quality objective for TPHg is not specified by the Basin Plan, other relevant water quality objectives for drinking water specify a goal of 5 ppb TPHg, based on taste and odor criteria (A Compilation of Water Quality Goals, Central Valley RWQCB, August 2003). Although the current maximum and overall representative concentrations of TPHg in on-site groundwater exceed this criterion, Cambria believes that decreasing concentration trends show that this criterion will be achieved on site at the site within a number of decades. Cambria believes this is a reasonable period of time.

California State Water Resources Control Board (SWRCB) Resolution 92-49 Section III.A states:

> ...Regional Water Boards shall: A. Concur with any investigative and cleanup and abatement proposal which the discharger demonstrates and the Regional Water Board finds to have a substantial likelihood to achieve compliance, within a reasonable time frame, with cleanup goals and objectives that implement the applicable Water Quality Control Plans and Policies adopted by the State Water Board and Regional Water Boards...

This policy was recently applied in a recent SWRCB Water Quality Order (2005-00002-UST), which stated:

> Resolution No. 92-49 does not require, however, that the requisite level of water quality be met at the time of site closure. Resolution No. 92-49 specifies compliance with cleanup goals and objectives within a reasonable time frame (*Id.* at section III.A.). Therefore, even if the requisite level of water quality has not yet been attained, a site may be closed if the level will be attained within a reasonable period.

In keeping with the SWRCB's position on similar sites, Cambria believes that the site does currently meet the closure objectives.

CONCLUSIONS

Since this risk evaluation incorporated conservative calculation of representative hydrocarbon concentrations in soil and groundwater and conservatively assumed residential site use, Cambria believes the results of this analysis indicate that residual hydrocarbons at this site do not pose a significant health risk to on-site or off-site occupants. Current TPHg concentrations exceed the SF RWQCB ESL for groundwater for commercial land use, where groundwater is not a current or potential source of drinking water.

Monitoring and investigation has shown that hydrocarbon concentrations in groundwater are decreasing with time and distance from the former UST complex, which indicates that the plume in groundwater is shrinking due to natural attenuation. Natural attenuation of the residual hydrocarbons will continue to occur over time, which will further reduce the concentrations to below the TPHg cleanup level and cleanup goal within a finite period of time.

We believe that the distribution of hydrocarbons on site has been adequately defined and that no additional investigation or corrective action is necessary. Since representative BTEX compounds soil and groundwater concentrations are already below the approved CAP cleanup levels, the applicable Oakland ULR Tier 2 SSTLs for Merritt Sands, and because TPHg concentrations will eventually meet the cleanup goal by natural attenuation, Cambria believes that case closure is appropriate.

CLOSURE REQUEST

Site soil and groundwater representative concentrations are below the cleanup levels and cleanup goals established in the approved CAP. TPHg concentrations in and groundwater show decreasing trends which indicate that the cleanup goal objective will be achieved in a reasonable amount of time. Cambria believes that the future achievement of the cleanup goal objective in a reasonable amount of time is consistent with intent of SWRCB Resolution 92-49. On behalf of Shell, Cambria requests case closure.

CLOSING

If you have any questions or comments, please call Matthew Derby at (510) 420-3332 or Ana Friel at (707)-268-3812.

Sincerely,
Cambria Environmental Technology, Inc.

Matthew W. Derby, P.E.
Senior Project Engineer

Figures:
1 - Vicinity/Area Well Survey Map
2 - Extended Site Plan
3 - Grain Size Analysis Soil Boring Locations
4 - 2003 Hydrogen Peroxide Injection Locations
5 - Depth to Groundwater vs. Time
6 - TPHg Soil Concentrations - A-A'
7 - Benzene Soil Concentrations - A-A'
8 - TPHg Soil Concentrations - B-B'
9 - Benzene Soil Concentrations B-B'
10 - MW-1 Benzene vs. Time
11 - VW/AS-1 and VW/AS-3 Benzene vs. Time
12 - Benzene Concentrations vs. Distance
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Tables:
1 - Cumulative Soil Analytical Results
2 - Groundwater Analytical Results
3 - Cleanup Levels and Cleanup Goals
4 - Groundwater Extraction – Mass Removal Data
5 - Vapor Extraction – Mass Removal Data
6 - Representative Surficial Soil Analytical Results
7 - Representative Subsurface Analytical Results
8 - Representative Groundwater Concentrations
9 - Merrit Sands Oakland Tier 2 SSTLs

Attachments:
A - Soil Boring Logs and Permit
B - Laboratory Report for Grain Size Analysis
C -Tank Protect Engineering's 1991 and 1993 Site Plans
D - Blaine Groundwater Monitoring Report Summary Table
E - *Geologic Map and Map Database of the Oakland Metropolitan Area, Alameda, Contra Costa, and San Francisco Counties, California*, USGS R.W. Graymer, 2000
F - *ProUCL* Statistics Calculations for Representative Subsurface Soil and Groundwater Data
G - Oakland ULR RBCA Cover Sheet, Eligibility Checklist, Exposure Assessment Worksheet, Merritt Sands Input Parameters, and Chemical Parameters

cc: Denis Brown, Shell Oil Products US, 20945 S. Wilmington Ave., Carson, CA 90810
Tom Saberi, 1045 Airport Boulevard, Suite 12, South San Francisco, CA 94080
Matthew Dudley, Sedgwick, Detert, Moran, & Arnold, 1 Embarcadero Center, 16th Floor, San Francisco, CA 94111-3628
Ellen Wyrick-Parkinson, 1420 Magnolia St, Oakland, CA 94607

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07/10/02

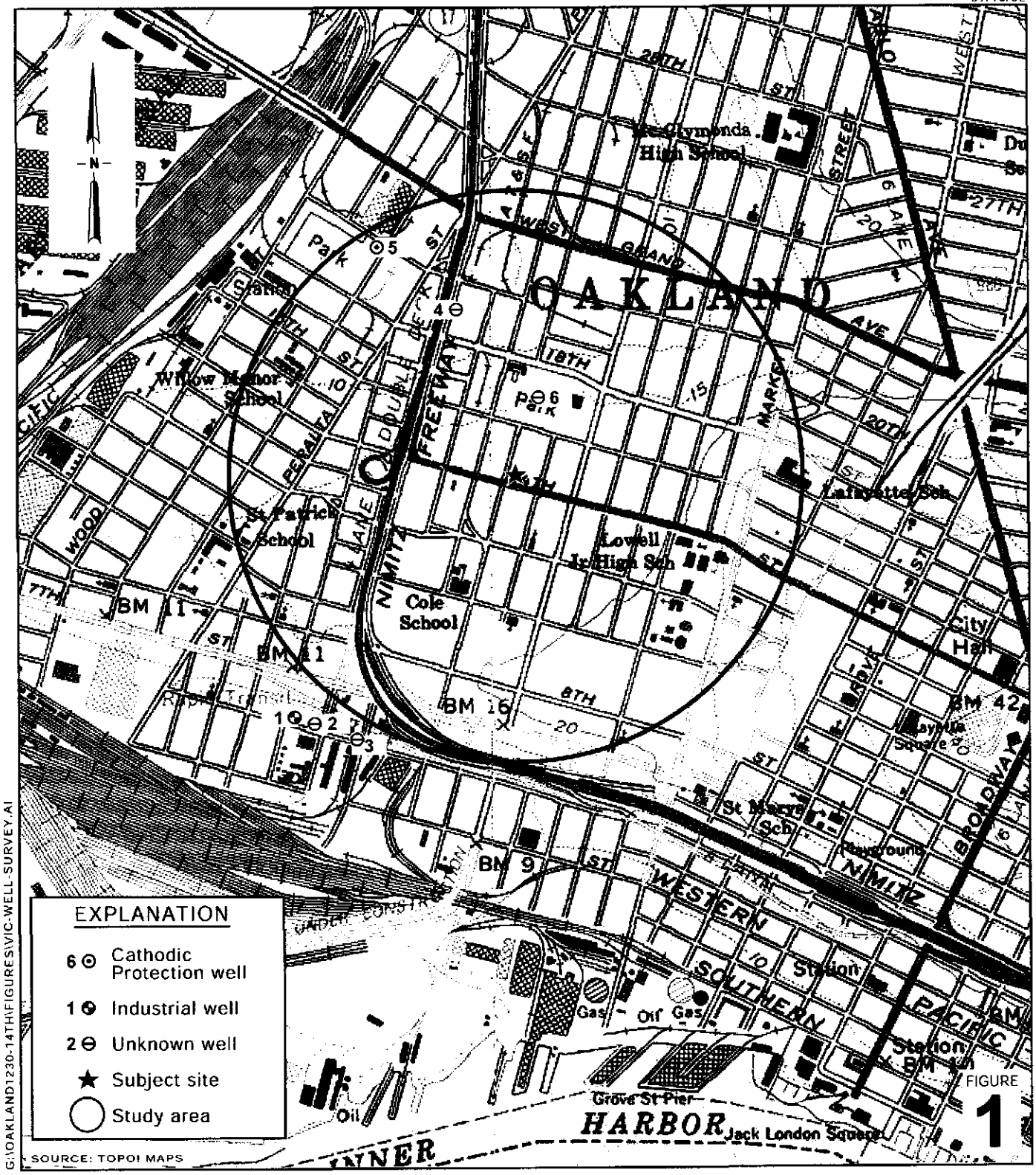


FIGURE 1

Former Shell Service Station
1230 14th Street
Oakland, California
Incident No.97088250

CAMBRIA

Vicinity/Area Well Survey Map
(1/2-Mile Radius)

03/24/05

EXPLANATION

HA-1 ⊕	Hand auger location (07/23/02)
S-14 ◧	Soil boring location (06/07,10/02)
S-11 ◆	Deeper soil boring location (06/07/02)
3' —◐	Proposed slanted soil boring showing slant direction and target depth
SB-1 •	Soil boring location (2/91)
TS-1 ▲	Product piping sample (11/95)
S2-15.0 ⊕	Tank Pit grab soil sample (1995)
SB-C ◉	Soil boring location (3/96)
GP-1 ◉	Soil boring location (12/00)
MW-1 ✦	Monitoring well location
VW/AS-1 ✦	Combination air sparge/soil vapor extraction well
VW/MW-2 ✦	Combination soil vapor extraction well/monitoring well

1430-32 Union St.

1426 Union St.

1418-20 Union St..

HA-4 ⊕

HA-3 ⊕

1419 Magnolia St.

HA-2 ⊕

HA-1 ⊕

MW-7 SB-E GP-4 GP-3 GP-2

Former Shell Service Station

1230 14th St.

S1 former waste oil tank pit

MW-4 MW-1 MW-6 GP-1

SB-1 VW/AS-1 SB-C VW/MW-2

S5 S4 S3 S2 S-16 S-14 S-15 MW-5 SB-2 S-13 S-17 S-12 S-11 S-10 S7 S8 S6 S9

TS-1 TS-3 TS-2 MW-3 VW/AS-3 SB-J former pump islands

SB-3

TS-4 TS-5 TS-6 VW/MW-4 3' S-18

GP-5 MW-2

1216 14th St.

1210 14th St.

1204-06-08 14th St.

Typical groundwater flow direction

14th STREET

0 15 30 60

Scale (ft)

FIGURE

2

Extended Site Plan

Former Shell Service Station

1230 14th Street

Oakland, California

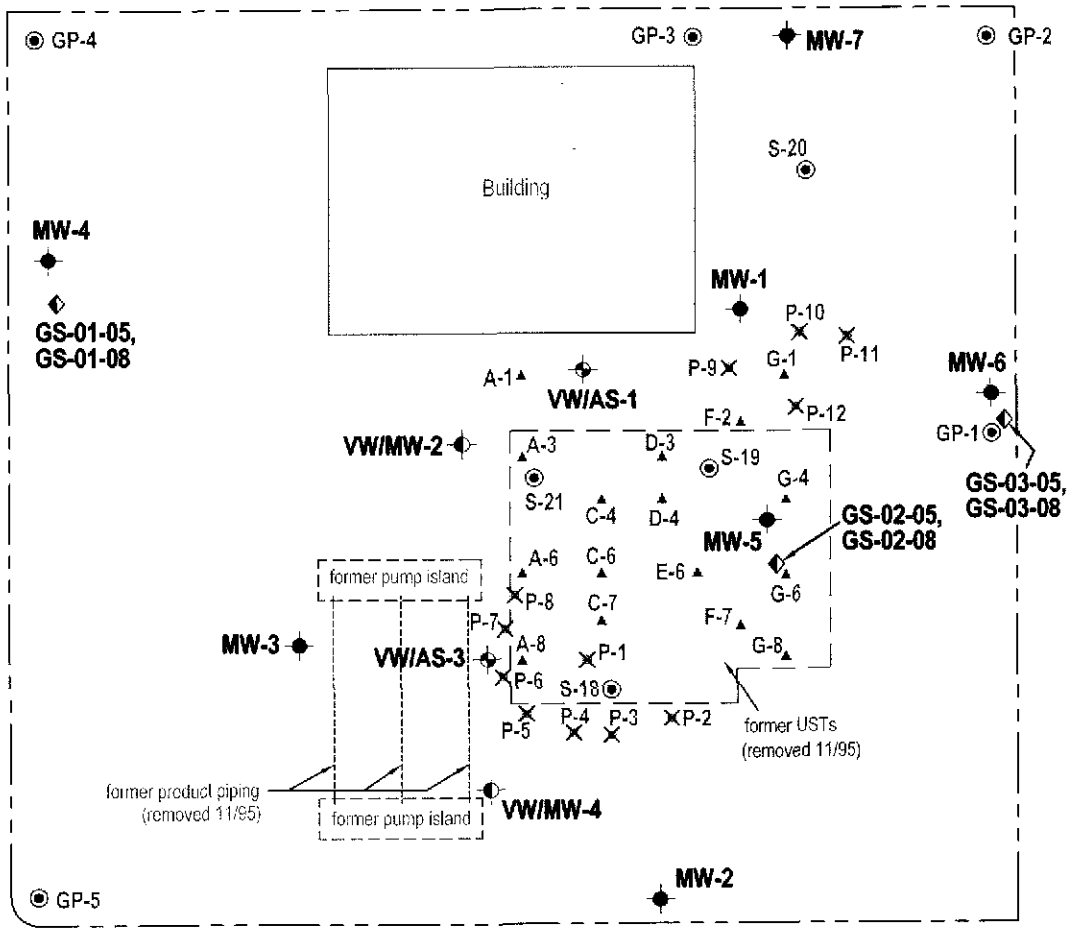
Incident No.97088250

CAMBRIA

G:\OAKLAND 1230 14TH\FIGURES\EXT-SITE PLAN 3-05.DWG

EXPLANATION

- GS-01-05 ◐ Grain-size analysis soil boring location
- MW-1 ✦ Monitoring well location
- VW/AS-1 ✦ Combination air sparge/soil vapor extraction well
- VW/MW-2 ✦ Combination soil vapor extraction well/monitoring well
- S-18 ◉ Confirmation soil boring (11/07/03)
- P-1 ✕ Destroyed peroxide injection port
- A-1 ▲ Peroxide injection location (03/17-20/03)
- GP-1 ◉ Soil boring location (12/11/00)



0 10 20

Scale (ft)

FIGURE

3

G:\OAKLAND 1230 14TH\FIGURES\SITE PLAN GRAIN-SIZE 3-05.DWG

Former Shell Service Station
1230 14th Street
Oakland, California
Incident No.97088250

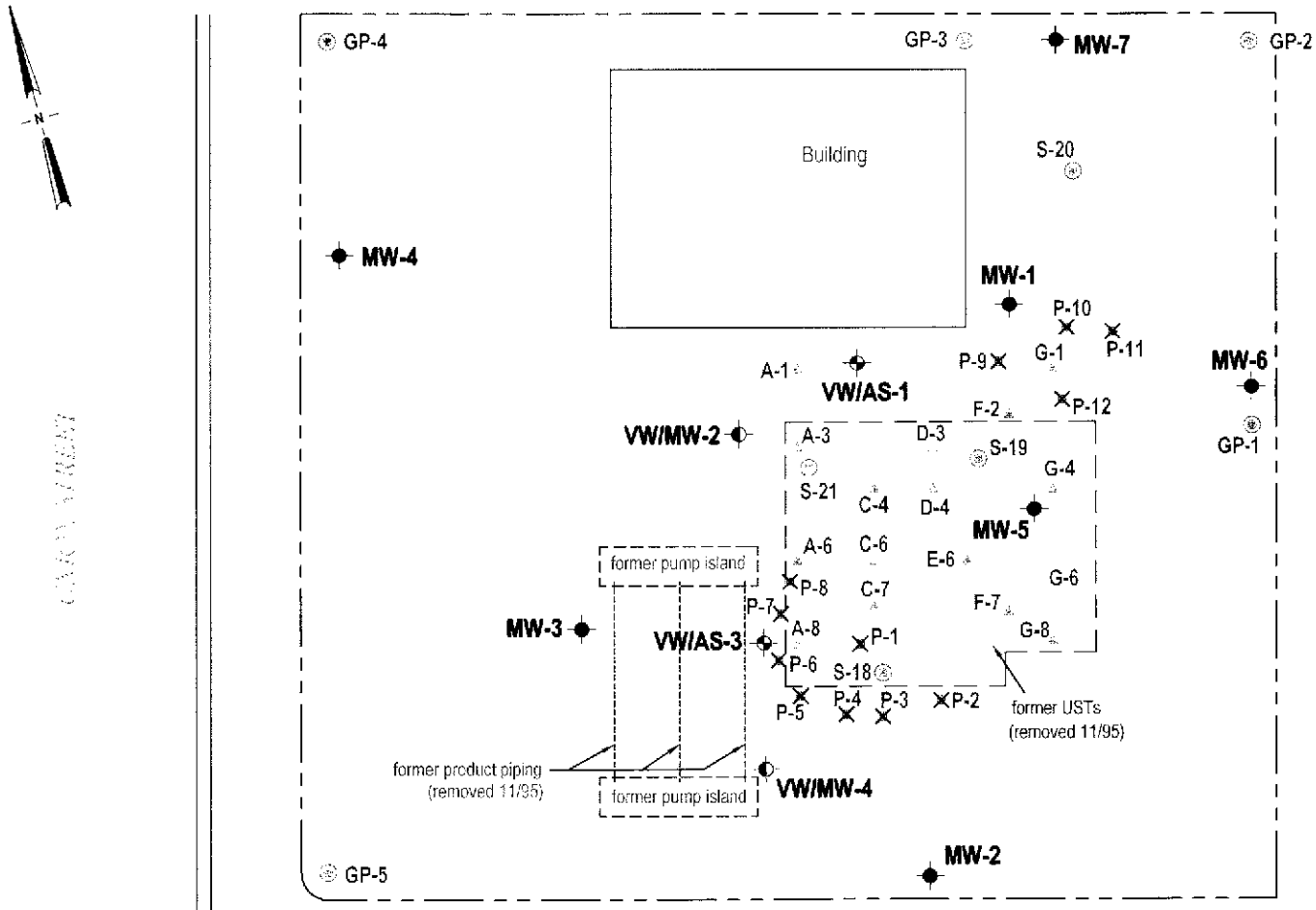
CAMBRIA

Grain Size Analysis Boring Locations

March 18, 2005

EXPLANATION

- MW-1 — Monitoring well location
- VW/AS-1 — Combination air sparge/soil vapor extraction well
- VW/MW-2 — Combination soil vapor extraction well/monitoring well
- S-18 — Confirmation soil boring (11/07/03)
- P-1 — Destroyed peroxide injection port
- A-1 — Peroxide injection location (03/17-20/03)
- GP-1 — Soil boring location (12/11/00)



0 10 20

Scale (ft)

FIGURE

4

G:\OAKLAND 1230 14TH\FIGURES\SITE PLAN 1-05.DWG

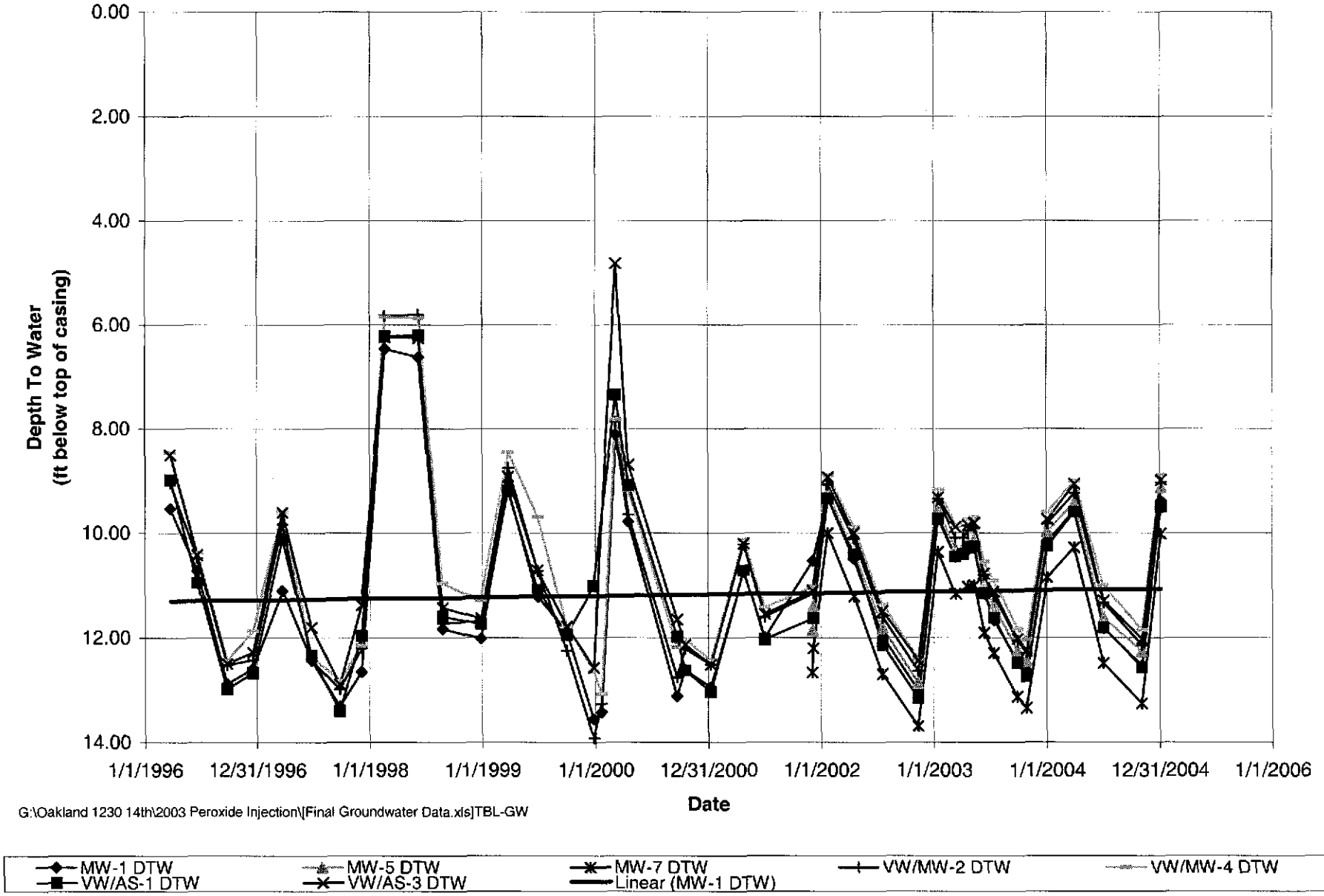
Former Shell Service Station
1230 14th Street
Oakland, California
Incident No.97088250

CAMBRIA

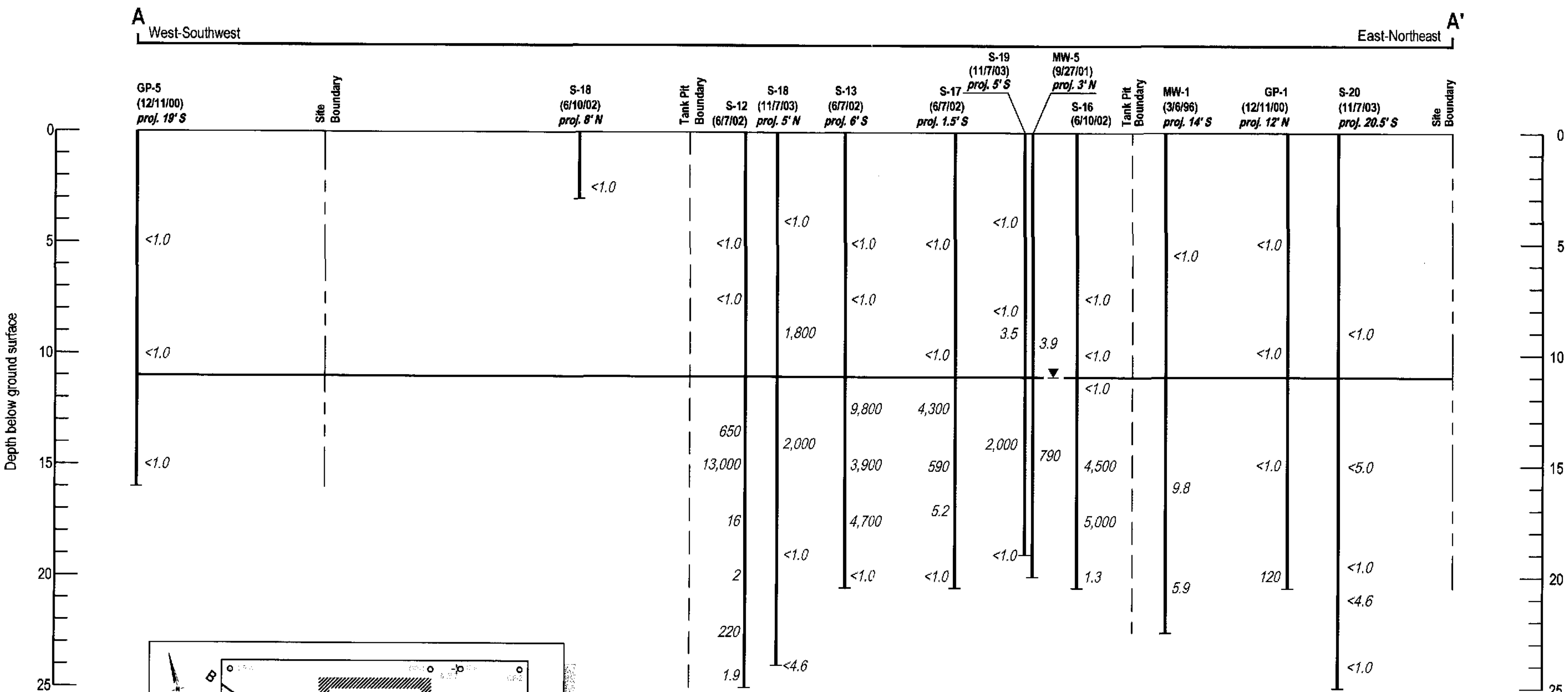
2003 Hydrogen Peroxide Injection Locations

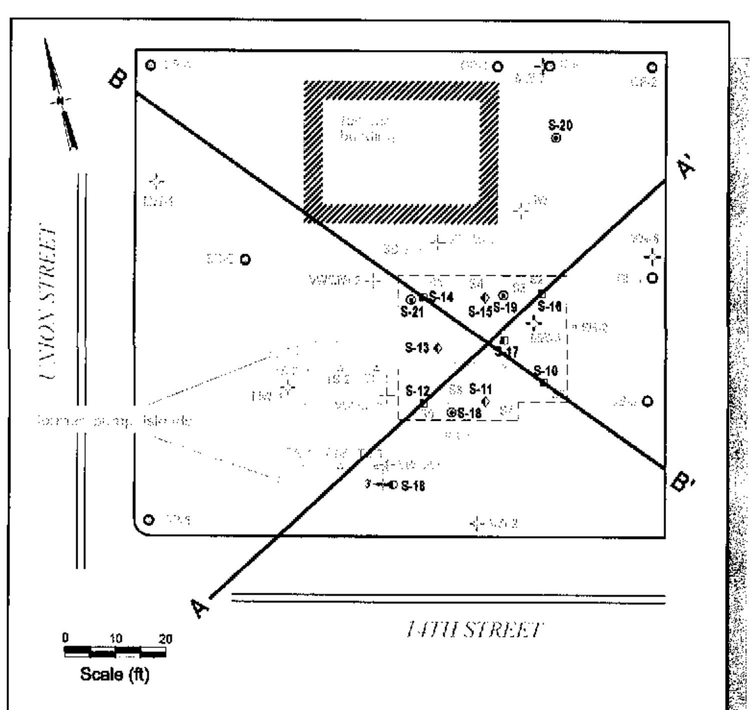
Figure 5 - Depth to Groundwater vs Time
Former Shell Station 1230 14th St, Oakland

CAMBRIA



TPHg Soil Concentrations A - A'





Scale (ft)
0 10
5

EXPLANATION

GP-5 (12/11/00) *projected 19' S*	Soil boring ID Sample date Boring location relative to A - A'	Soil Boring
<1.0	TPHg concentration in soil, in ppm	
—▼—	Static Depth of Groundwater (06/07/02)	Bottom of boring

CAMBRIA

FIGURE 6

Former Shell Service Station
1230 14th Street
Oakland, California
Incident No.97088250

G:\OAKLAND 1230 14TH\FIGURES\TPHG-X-SECT-A.DWG

04/04/05

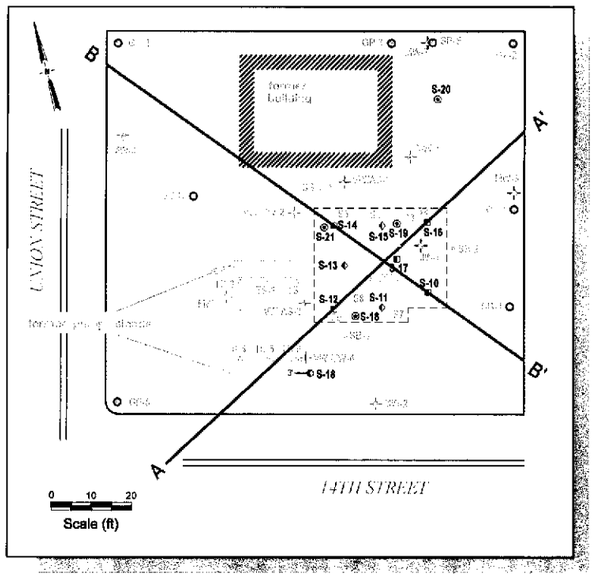
Benzene Soil Concentrations
A - A'

A — West-Southwest — A'

East-Northeast

Depth below ground surface

GP-5 (12/11/00) *proj. 19' S*	Site Boundary	S-18 (6/10/02) *proj. 8' N*	Tank Pit Boundary	S-12 (6/7/02)	S-18 (11/7/03) *proj. 5' N*	S-13 (6/7/02) *proj. 6' S*	S-17 (6/7/02) *proj. 1.5' S*	S-19 (11/7/03) *proj. 5' S*	MW-5 (9/27/01) *proj. 3' N*	S-16 (6/10/02)	Tank Pit Boundary	MW-1 (3/6/96) *proj. 14' S*	GP-1 (12/11/00) *proj. 12' N*	S-20 (11/7/03) *proj. 20.5' S*	Site Boundary
<0.0050		<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		<0.0025	<0.0050		
<0.0050				<0.005	4.0	<0.005	<0.005	<0.005	<0.0050	<0.005			<0.0050	<0.0050	
<0.0050				5.7	27	26	0.64	9.6	2.7	<0.005					
				130		37	0.41			<1.0		1.9	<0.0050	1.2	
				0.65		6.5	0.57			<1.0					
				0.058	0.028	0.028	<0.005	0.0075		0.12		0.89	<0.020	<0.0050	
				1.3										0.84	
				0.047	<0.0050									<0.0050	



5
Scale (ft)
0 10

EXPLANATION

GP-5	Soil boring ID	Soil Boring
(12/11/00)	Sample date	
projected 19' S	Boring location relative to A - A'	
<0.0050	Benzene concentration in soil, in ppm	
▼	Static Depth of Groundwater (06/07/02)	Bottom of boring

FIGURE
7

Former Shell Service Station
1230 14th Street
Oakland, California
Incident No.97088250

CAMBRIA

G:\OAKLAND 1230 14TH\FIGURES\BENZ-X-SECT-A.DWG

04/04/05

TPHg Soil Concentrations
B - B'

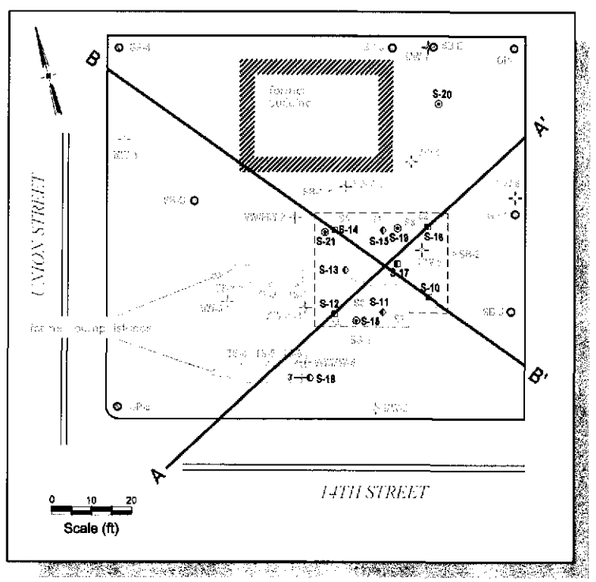
B — Northwest — B'

Southeast

GP-4 (12/11/00) *proj. 5' W*	MW-4 (3/8/96) *proj. 12.5' E*	SB-C (3/8/96) *proj. 14' E*	VW/MW-2 (3/7/96) *proj. 4' E*	SB-1 (2/91) *proj. 7' W*	SB-21 (11/7/03) *proj. 2' E*	S-14 (6/7/02)	S-15 (6/10/02) *proj. 7' W*	S-17 (6/10/02) *proj. 2' W*	S-10 (6/7/02)	Tank Pit Boundary	SB-J (3/8/96) *proj. 9' W*	Site Boundary
<1.0				11	<1.0	<1.0	<1.0	<1.0	<1.0			
<1.0	<1.0		<1.0	4.6	<1.0	<1.0	<1.0		<1.0			
		<1.0	<1.0		680	<1.0	2.3	<1.0	<1.0		<1.0	
<1.0		1.9		7.5	1,400	670	<1.0	4,300	1,700			
						1,100	1,200	590	4,300			
						3.8	24	5.2	<1.0			
			2.9		<1.0	4	270	<1.0	690			
					<1.0				<1.0			
									<1.0			

Depth below ground surface: 0, 5, 10, 15, 20, 25

Tank Pit Boundary



5
Scale (ft)
0 10

EXPLANATION

GP-4	Soil boring ID
(12/11/00)	Sample date
projected 5' W	Boring location relative to B - B'
<1.0	TPHg concentration in soil, in ppm
▼	Static Depth of Groundwater (06/07/02)

Soil Boring

Bottom of boring

FIGURE

8

Former Shell Service Station
1230 14th Street
Oakland, California
Incident No.97088250

CAMBRIA

G:\OAKLAND 1230 14TH\FIGURES\TPHG-X-SECT-B.DWG

04/04/05

Benzene Soil Concentrations
B - B'

B — Northwest — B'

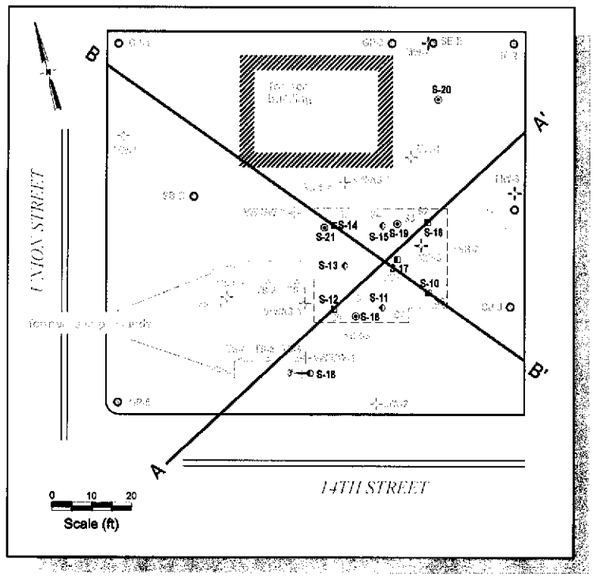
Southeast

GP-4 (12/11/00) proj. 5' W	MW-4 (3/8/96) proj. 12.5' E	SB-C (3/8/96) proj. 14' E	VW/MW-2 (3/7/96) proj. 4' E	SB-1 (2/91) proj. 7' W	SB-21 (11/7/03) proj. 2' E	S-14 (6/7/02)	S-15 (6/10/02) proj. 7' W	S-17 (6/10/02) proj. 2' W	S-10 (6/7/02)	Tank Pit Boundary	SB-J (3/8/96) proj. 9' W	Site Boundary
<0.0050				0.014	<0.005	<0.005	<0.005	<0.005	<0.005			
<0.0050	<0.0025		<0.0025		<0.005	<0.005	<0.005		<0.005			
			0.0032	0.15	<0.005	<0.005	<0.005	<0.005	<0.005		<0.0025	
<0.0050		<0.0025			<0.5	<0.005						
					5.5	<0.25	<0.005	0.64	1.2			
		0.022		2.1		0.88	1.9	0.41	4.3			
						0.1	1.3	0.57	0.012			
			0.47		0.0083	0.39	0.51	<0.005	2			
					<0.005				<0.005			
									<0.005			

Depth below ground surface

Site Boundary

Tank Pit Boundary



Scale (ft)

0 10

EXPLANATION

GP-4	Soil boring ID
(12/11/00)	Sample date
projected 5' W	Boring location relative to B - B'
<0.0050	Benzene concentration in soil, in ppm
▼	Static Depth of Groundwater (06/07/02)

Soil Boring

Bottom of boring

FIGURE

9

Former Shell Service Station
1230 14th Street
Oakland, California
Incident No.97088250

CAMBRIA

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Figure 10 - MW-1 Benzene vs Time
Former Shell Station 1230 14th St, Oakland

CAMBRIA

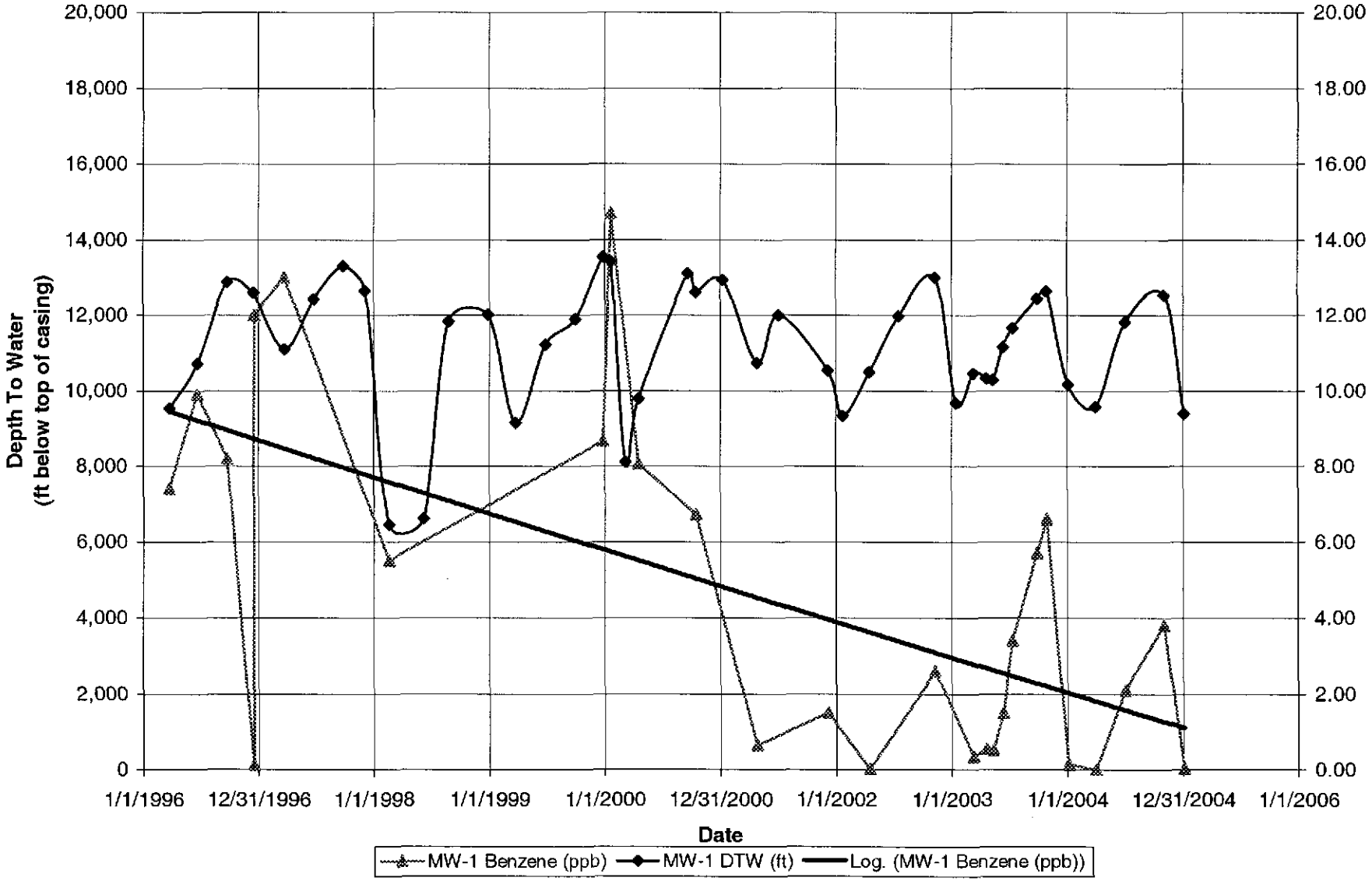

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Figure 11 - VW/AS-1 and VW/AS-3 Benzene vs Time
Former Shell Station 1230 14th St, Oakland

CAMBRIA

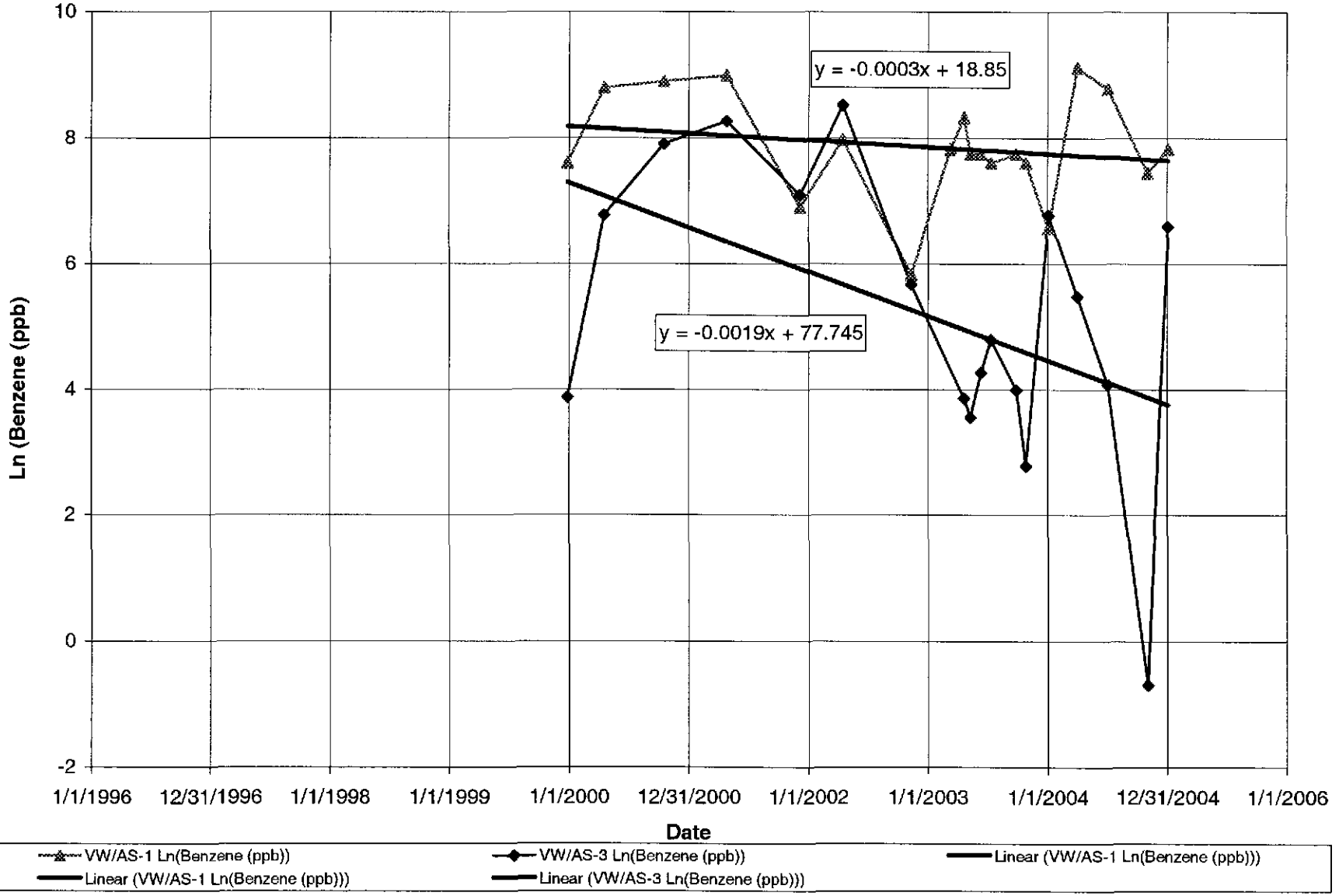

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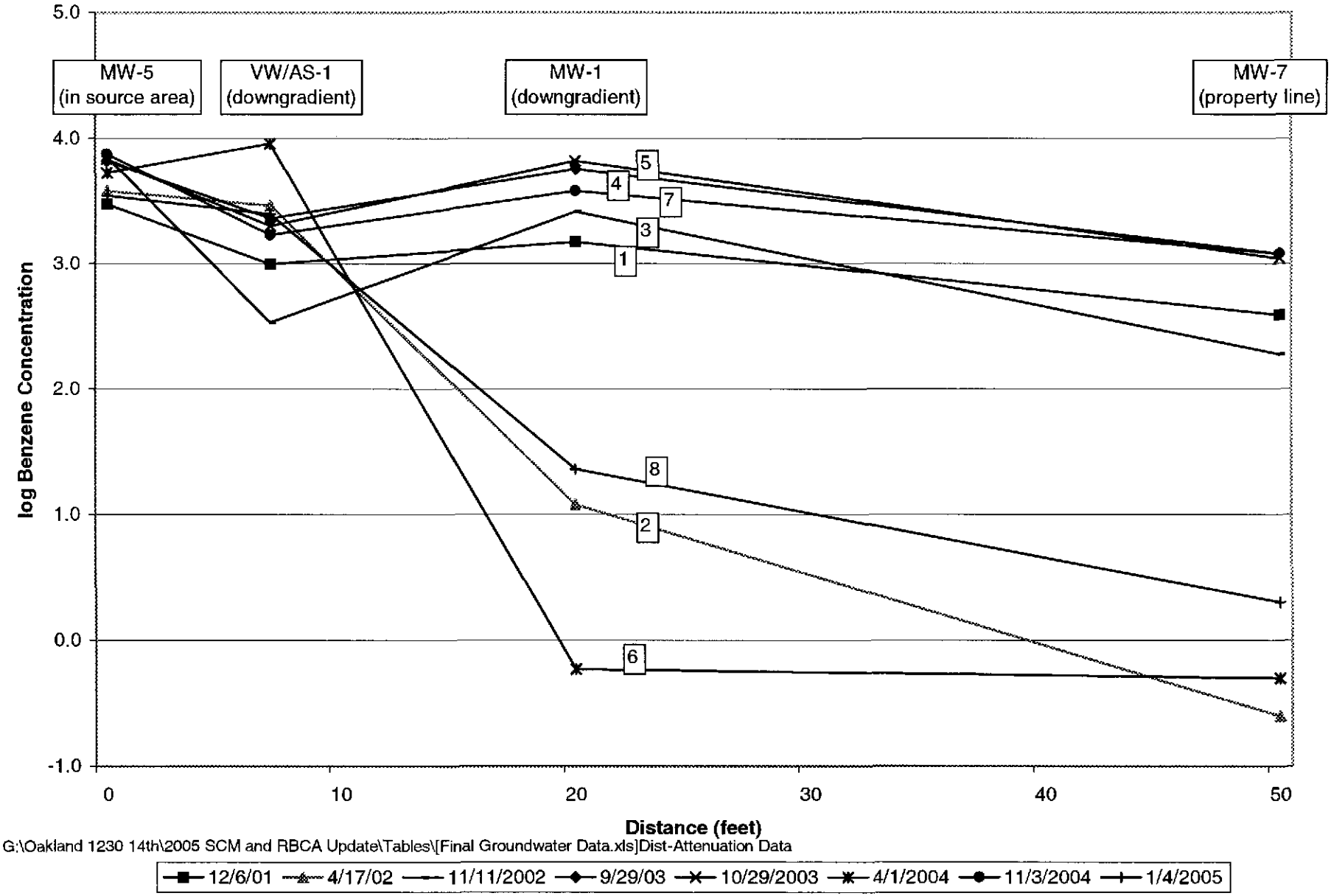
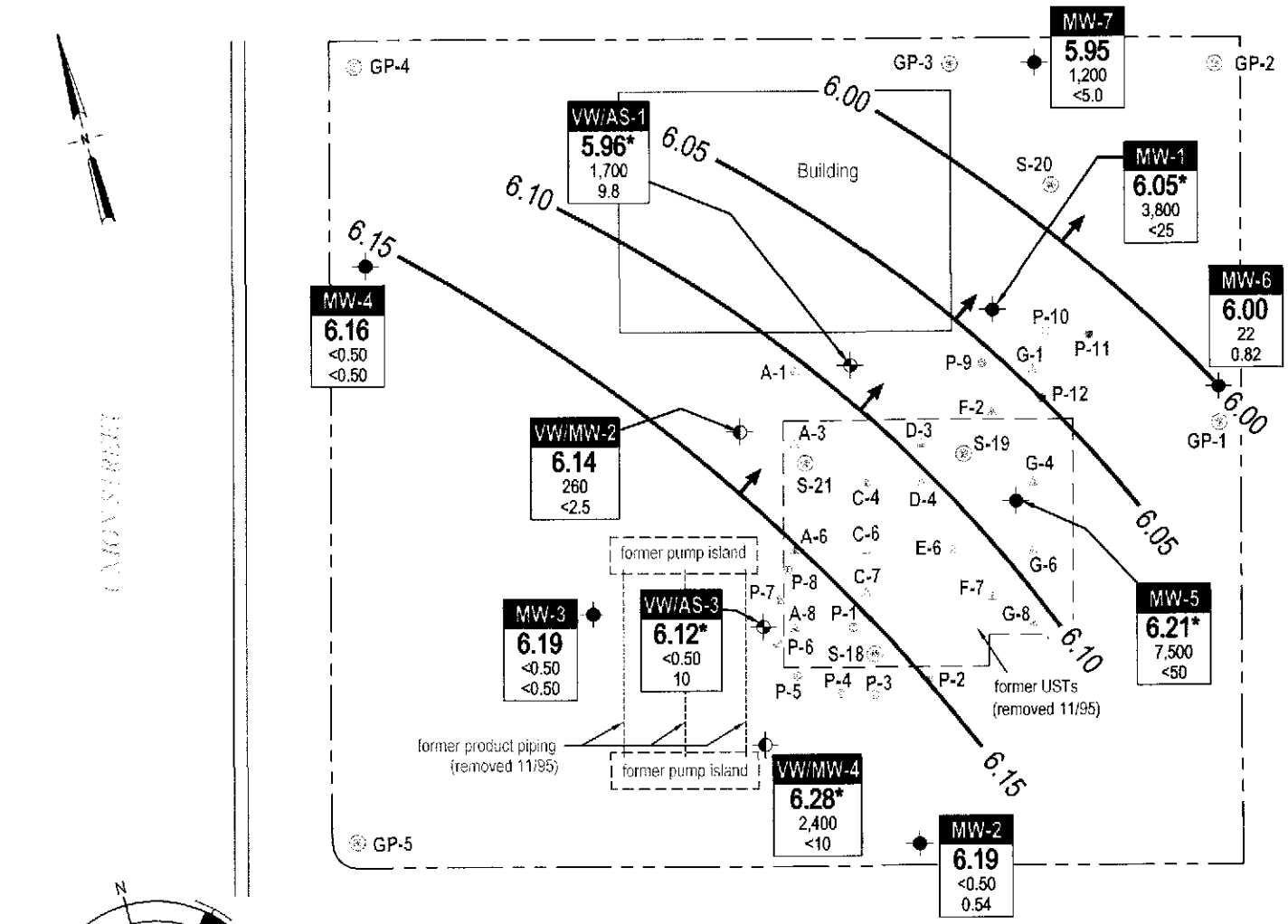
Figure 12 - Benzene Concentrations vs. Distance
1230 14th Street, Oakland



G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\[Final Groundwater Data.xls]Dist-Attenuation Data

EXPLANATION

- MW-1 — Monitoring well location
- VW/AS-1 — Combination air sparge/soil vapor extraction well
- VW/MW-2 — Combination soil vapor extraction well/monitoring well
- S-18 — Confirmation soil boring (11/07/03)
- P-1 — Peroxide injection port (9/22-25/03)
- A-1 — Peroxide injection location (03/17-20/03)
- GP-1 — Soil boring location (12/11/00)
- * — Data anomalous, not used for contouring
- → — Groundwater flow direction
- XX.XX — Groundwater elevation contour, in feet above mean sea level (msl), approximately located, dashed where inferred
- Well / ELEV / Benzene / MTBE — Well designation; Groundwater elevation, in feet above msl; Benzene and MTBE concentrations are in parts per billion and are analyzed by EPA Method 8260



Groundwater Flow Direction
(3Q00 through 4Q04)

0 10 20
Scale (ft)

FIGURE
13

G:\OAKLAND 1230 14TH\FIGURES\4QM04.DWG

Former Shell Service Station
1230 14th Street
Oakland, California
Incident No.97088250

CAMBRIA

Groundwater Elevation Contour Map

November 3, 2004

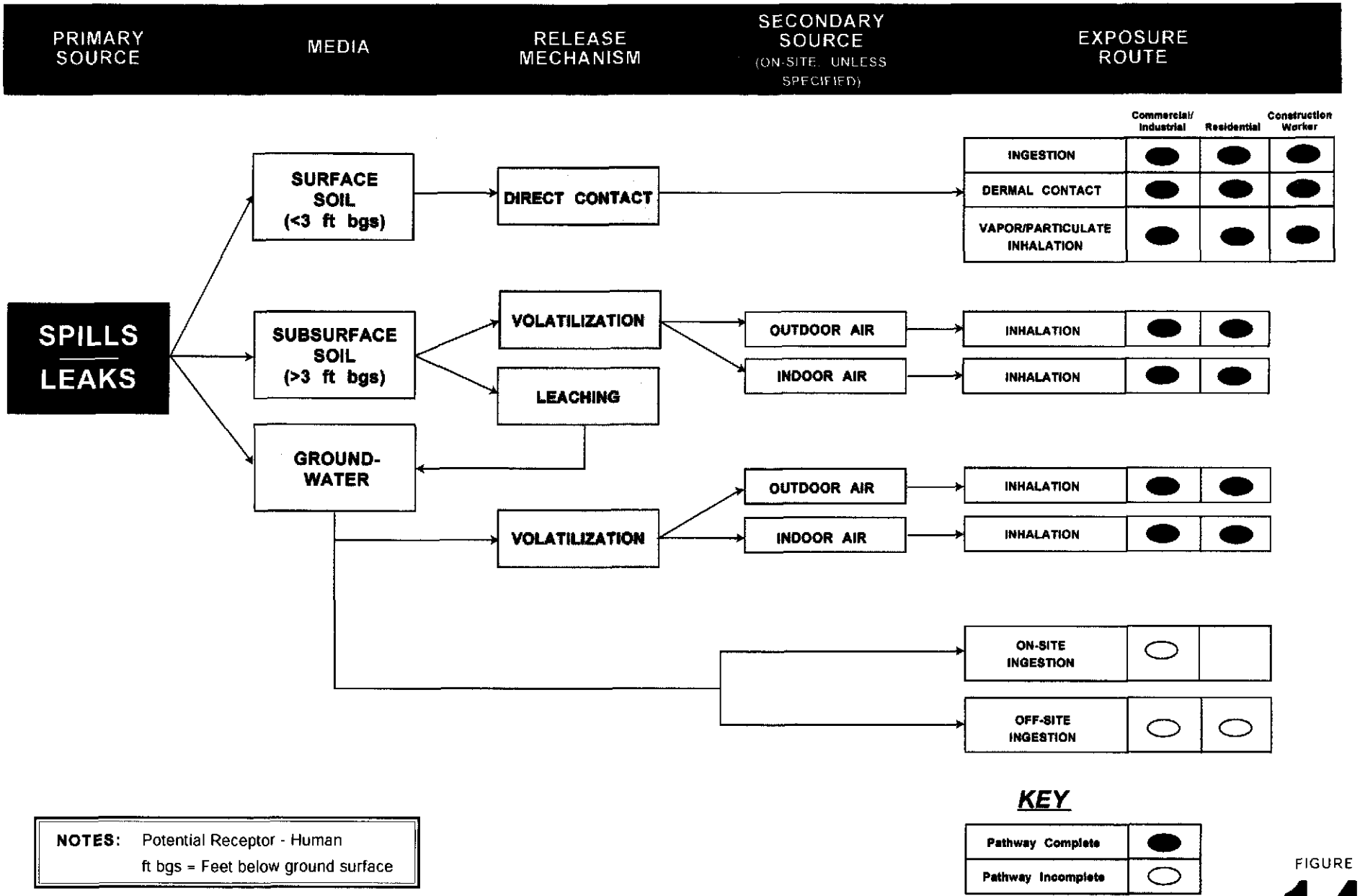


FIGURE
14

Former Shell Service Station
1230 14th Street
Oakland, California
Incident No.97088250

CAMBRIA

Conceptual Site Model
Exposure Pathways

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Table 1 Cumulative Soil Analytical Results - Former Shell-branded Service Station, 1230 14th St., Oakland, California
Incident #97088250

Sample ID	Date	Depth (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	Oil and Grease	TPHd
			←			(ppm)				→
November 2003 Post-Peroxide Injection Sampling										
S-18-4	11/7/2003	4	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--
S-18-9	11/7/2003	9	**1,800**	**4.0**	**35**	**21**	**150**	--	--	--
S-18-14	11/7/2003	14	**2,000**	**27**	**120**	**42**	**230**	--	--	--
S-18-19	11/7/2003	19	<1.0	**0.028**	**0.073**	**0.019**	**0.10**	--	--	--
S-18-24	11/7/2003	24	<4.6	<0.023	**0.027**	<0.023	**0.061**	--	--	--
S-19-4	11/7/2003	4	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--
S-19-8	11/7/2003	8	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--
S-19-9	11/7/2003	9	**3.5**	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--
S-19-14	11/7/2003	14	**2,000**	**9.6**	**71**	**34**	**190**	--	--	--
S-19-19	11/7/2003	19	<1.0	**0.0075**	**0.017**	**0.0079**	**0.036**	--	--	--
S-20-9	11/7/2003	9	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--
S-20-15	11/7/2003	15	<5.0	**1.2**	<0.025	**0.095**	**0.026**	--	--	--
S-20-19.5	11/7/2003	19.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--
S-20-21	11/7/2003	21	<4.6	**0.84**	<0.023	**0.067**	**0.026**	--	--	--
S-20-24	11/7/2003	24	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--
S-21-4	11/7/2003	4	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--
S-21-9	11/7/2003	9	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--
S-21-11	11/7/2003	11	**680**	<0.50	<0.50	**4.4**	**14**	--	--	--
S-21-14	11/7/2003	14	**1,400**	**5.5**	**67**	**26**	**130**	--	--	--
S-21-19	11/7/2003	19	<1.0	**0.0083**	**0.033**	**0.010**	**0.044**	--	--	--
S-21-24	11/7/2003	24	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--
June 2002 Soil Investigation										
S-10 5.0-5.5	6/7/2002	5.0	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-10 8.5-9.0	6/7/2002	8.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-10 10-10.5	6/7/2002	10.0	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-10 12.5-13	6/7/2002	12.5	**1,700**	**1.2**	**6.3**	**25**	**120**	--	--	--
S-10 15-15.5	6/7/2002	15.0	**4,300**	**4.3**	**46**	**57**	**470**	--	--	--
S-10 17.5-18	6/7/2002	17.5	<1.0	**0.012**	**0.012**	**0.012**	**0.062**	--	--	--
S-10 20-20.5	6/7/2002	20.0	**690**	**2**	**9.1**	**11**	**56**	--	--	--
S-10 22.5-23	6/7/2002	22.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-10 24.5-25	6/7/2002	24.5	<1.0	<.005	<.005	<.005	<.005	--	--	--

Table 1 Cumulative Soil Analytical Results - Former Shell-branded Service Station, 1230 14th St., Oakland, California
Incident #97088250

Sample ID	Date	Depth (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	Oil and Grease	TPHd
			←			(ppm)				→
S-11 5-5.5	6/7/2002	5.0	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-11 7.5-8	6/7/2002	7.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-11 10.5-11	6/7/2002	10.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-11 12.5-13	6/7/2002	12.5	**1,400**	**3.7**	**26**	**21**	**140**	--	--	--
S-11 15-15.5	6/7/2002	15.5	**3,200**	**8.6**	**55**	**42**	**230**	--	--	--
S-11 17.5-18	6/7/2002	17.5	**330**	**1.3**	**5.9**	**4.2**	**24**	--	--	--
S-11 20-20.5	6/7/2002	20.0	<1.0	**0.015**	**0.018**	<0.005	**0.019**	--	--	--
S-11 22.5-23	6/7/2002	22.5	<1.0	**0.019**	**0.045**	**0.015**	**0.092**	--	--	--
S-11 24.5-25	6/7/2002	24.5	<1.0	**0.01**	**0.023**	**0.062**	**0.037**	--	--	--
S-11 26-26.5	6/7/2002	26.0	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-11 28.5-29	6/7/2002	28.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-12 5-5.5	6/7/2002	5.0	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-12 7.5-8	6/7/2002	7.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-12 13.5-14	6/7/2002	13.5	**650**	**5.7**	**30**	**12**	**64**	--	--	--
S-12 15-15.5	6/7/2002	15.0	**13,000**	**130**	**740**	**290**	**1,500**	--	--	--
S-12 17.5-18	6/7/2002	17.5	**16**	**0.65**	**2.1**	**0.42**	**2.3**	--	--	--
S-12 20-20.5	6/7/2002	20.0	**2**	**0.058**	**0.19**	**0.049**	**0.29**	--	--	--
S-12 22.5-23	6/7/2002	22.5	**220**	**1.3**	**9**	**4.2**	**24**	--	--	--
S-12 24.5-25	6/7/2002	24.5	**1.9**	**0.047**	**0.2**	**0.052**	**0.26**	--	--	--
S-13 5-5.5	6/7/2002	5.0	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-13 7.5-8	6/7/2002	7.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-13 12.5-13	6/7/2002	12.5	**9,800**	**26**	**310**	**130**	**1,100**	--	--	--
S-13 15-15.5	6/7/2002	15.0	**3,900**	**37**	**180**	**76**	**360**	--	--	--
S-13 17.5-18	6/7/2002	17.5	**4,700**	**6.5**	**130**	**59**	**580**	--	--	--
S-13 20-20.5	6/7/2002	20.0	**<1.0**	**0.028**	**0.0085**	**<0.005**	**0.068**	--	--	--
S-14 5.5-6	6/10/2002	5.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-14 7.5-8	6/10/2002	7.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-14 9-9.5	6/10/2002	9.0	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-14 11.5-12	6/10/2002	11.5	<1.0	<.005	<.005	<.005	**0.0078**	--	--	--
S-14 12.5-13	6/10/2002	12.5	**670**	<0.25	**0.71**	**5.4**	**19**	--	--	--
S-14 15-15.5	6/10/2002	15.0	**1,100**	**0.88**	**25**	**22**	**120**	--	--	--
S-14 17.5-18	6/10/2002	17.5	**3.8**	**0.1**	**0.3**	**0.89**	**0.48**	--	--	--
S-14 20-20.5	6/10/2002	20.0	**4**	**0.39**	**0.51**	**0.12**	**0.5**	--	--	--

Table 1 Cumulative Soil Analytical Results - Former Shell-branded Service Station, 1230 14th St., Oakland, California
Incident #97088250

Sample ID	Date	Depth (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	Oil and Grease	TPHd
			←			(ppm)				→
S-15 5-5.5	6/10/2002	5.0	<1.0	<.005	<.005	<.005	0.011	--	--	--
S-15 7.5-8	6/10/2002	7.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-15 10-10.5	6/10/2002	10.0	**2.3**	<.005	<.005	<.005	<.005	--	--	--
S-15 12.5-13	6/10/2002	12.5	<1.0	<.005	<.005	<.005	0.032	--	--	--
S-15 15-15.5	6/10/2002	15.0	**1,200**	**1.9**	**4.3**	**22**	**110**	--	--	--
S-15 17.5-18	6/10/2002	17.5	**24**	**1.3**	**1.9**	**0.4**	**1.9**	--	--	--
S-15 20-20.5	6/10/2002	20.0	**270**	**0.51**	**3.5**	**4.2**	**21**	--	--	--
S-16 7.5-8	6/10/2002	7.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-16 10-10.5	6/10/2002	10.0	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-16 11.5-12	6/10/2002	11.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-16 15-15.5	6/10/2002	15.0	**4,500**	<1.0	**4**	**94**	**460**	--	--	--
S-16 17.5-18	6/10/2002	17.5	**5,000**	<1.0	**23**	**76**	**360**	--	--	--
S-16 20-20.5	6/10/2002	20.0	**1.3**	**0.12**	**0.0088**	**0.08**	**0.08**	--	--	--
S-17 5-5.5	6/10/2002	5.0	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-17 10-10.5	6/10/2002	10.0	<1.0	<.005	<.005	<.005	<.005	--	--	--
S-17 12.5-13	6/10/2002	12.5	**4,300**	**0.64**	**6.8**	**48**	**340**	--	--	--
S-17 15-15.5	6/10/2002	15.0	**590**	**0.41**	**5.8**	**11**	**58**	--	--	--
S-17 17.5-18	6/10/2002	17.0	**5.2**	**0.57**	**0.073**	**0.16**	**0.66**	--	--	--
S-17 20-20.5	6/10/2002	20.0	<1.0	<.005	<.005	<.005	**0.013**	--	--	--
S-18 2.5-3	6/10/2002	2.5	<1.0	<.005	<.005	<.005	<.005	--	--	--
MW-5 Installation										
MW-5-9.5	9/27/2001	9.5	**3.9**	<0.0050	<0.0050	**0.0069**	**0.019**	<0.50	--	--
MW-5-14.0	9/27/2001	14.5	**790**	**2.7**	**30**	**11**	**67**	<1.0	--	--

Table 1 Cumulative Soil Analytical Results - Former Shell-branded Service Station, 1230 14th St., Oakland, California
Incident #97088250

Sample ID	Date	Depth (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	Oil and Grease	TPHd
			←			(ppm)				→
December 2000 Geoprobe Investigation										
GP-1-5	12/11/2000	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-1-10	12/11/2000	10.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-1-15	12/11/2000	15.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-1-20	12/11/2000	20.0	**120**	<0.020	**0.022**	**0.64**	**1.1**	<0.020	--	--
GP-2-5	12/11/2000	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-2-10.5	12/11/2000	10.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-2-15	12/11/2000	15.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-3-5	12/11/2000	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-3-10.0	12/11/2000	10.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-3-15.0	12/11/2000	15.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-4-5	12/11/2000	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-4-10	12/11/2000	10.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-4-15	12/11/2000	15.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-5-5	12/11/2000	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-5-10	12/11/2000	10.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
GP-5-15	12/11/2000	15.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
March 1996 Investigation										
SB-A/(MW-1)-10.5	03/06/96	10.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	**160**	--
SB-A/(MW-1)-16.0	03/06/96	16.0	**9.8**	**1.9**	**0.4**	**0.22**	**1.1**	--	**57**	--
SB-A/(MW-1)-20.5	03/06/96	20.5	**5.9**	**0.89**	**0.049**	**0.19**	**0.25**	--	**80**	--
SB-B/(MW-2)-10.5	03/06/96	10.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--	--
SB-B/(MW-2)-16.0	03/06/96	16.0	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--	--
SB-C-11.75	03/06/96	11.8	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--	--
SB-C-15.5	03/06/96	15.5	**1.9**	**0.022**	**0.12**	**0.086**	**0.32**	--	--	--
SB-D/(MW-3)-10.5	03/06/96	10.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--	--
SB-D/(MW-3)-15.5	03/06/96	15.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--	--
SB-E-10.5	03/06/96	10.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	<50	--
SB-E-16.0	03/06/96	16.0	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	200	--

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Incident #97088250

Sample ID	Date	Depth (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	Oil and Grease	TPHd
			←			(ppm)				→
SB-F(VW/AS)-1-5.5	03/07/96	5.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--	--
SB-F(VW/AS-1)-10.5	03/07/96	10.5	**62**	**0.97**	**4.2**	**1.4**	**8.0**	--	--	--
SB-F(VW/AS-1)-15.5	03/07/96	15.5	**7.4**	**1.7**	**0.44**	**0.2**	**0.6**	--	--	--
SB-F(VW/AS-1)-20.5	03/07/96	20.5	**20**	**2.6**	**1.7**	**0.5**	**2.0**	--	--	--
SB-G(VW/MW-2)-8.5	03/07/96	8.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--	--
SB-G(VW/MW-2)-10.5	03/07/96	10.5	<1.0	**0.0032**	<0.0025	<0.0025	<0.0025	--	--	--
SB-G(VW/MW-2)-20.5	03/07/96	20.5	**2.9**	**0.47**	**0.34**	**0.15**	**0.57**	--	--	--
SB-H(VW/AS-3)-8.5	03/07/96	8.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--	--
SB-H(VW/AS-3)-10.5	03/07/96	10.5	<1.0	**0.018**	<0.0025	<0.0025	**0.014**	--	--	--
SB-H(VW/AS-3)-21.0	03/07/96	21.0	**1.0**	**0.047**	**0.016**	**0.0037**	**0.017**	--	--	--
SB-I(VW/MW-4)-5.5	03/08/96	5.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--	--
SB-I(VW/MW-4)-8.5	03/08/96	8.5	**80**	**0.14**	**0.33**	**1.3**	**5.2**	--	--	--
SB-I(VW/MW-4)-15.5	03/08/96	15.5	**3.4**	**0.23**	**0.093**	**0.1**	**0.42**	--	--	--
SB-J-10.5	03/08/96	10.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--	--
SB-K(MW-4)-10.5	03/08/96	10.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--	--
Product Piping Samples										
TS-1-4.0	11/27/1995	4	<1.0	<0.0050	**0.005**	<0.0050	<0.0050	--	--	--
TS-2-2.0	11/27/1995	2	<1.0	<0.0050	**0.0057**	<0.0050	**0.0075**	--	--	--
TS-3-3.0	11/27/1995	3	<1.0	<0.0050	<0.0050	<0.0050	**0.0069**	--	--	--
TS-4-3.0	11/27/1995	3	<0.005	**0.011**	**0.038**	**0.0073**	**0.043**	--	--	--
TS-5-2.5	11/27/1995	2.5	**46**	<0.10	<0.10	<0.10	**2**	--	--	--
TS-6-3.0	11/27/1995	3	**3,100**	**30**	<6.0	**33**	**230**	--	--	--
Tankpit Excavation Confirmation Samples										
S2-15.0	11/27/1995	15	**3,600**	<6.0	**140**	**78**	**430**	--	--	--
S3-15.0	11/27/1995	15	**1,000**	**7.6**	**33**	**19**	**100**	--	--	--
S4-15.0	11/27/1995	15	**5,600**	**72**	**280**	**110**	**580**	--	--	--
S5-15.0	11/27/1995	15	**2,800**	**36**	**160**	**64**	**350**	--	--	--
S6-15.0	11/27/1995	15	**3,800**	<6.0	<6.0	**76**	**350**	--	--	--
S7-15.0	11/27/1995	15	**570**	<0.50	<0.50	**4.9**	**13**	--	--	--
S8-15.0	11/27/1995	15	**3,200**	**60**	**200**	**69**	**350**	--	--	--
S9-15.0	11/27/1995	15	**5,100**	**62**	**260**	**110**	**570**	--	--	--

Table 1 Cumulative Soil Analytical Results - Former Shell-branded Service Station, 1230 14th St., Oakland, California
Incident #97088250

Sample ID	Date	Depth (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	Oil and Grease	TPHd
			←			(ppm)				→
1993 UST and Dispenser Removal Samples										
S-1	08/25/93	8.5	67	0.038	0.089	0.110	0.380	--	7,700	1,200
S-2	08/25/93	14.0	2,200	1.4	3.2	3.5	13	--	--	--
S-3	08/25/93	11.0	530	0.4	0.76	0.83	3.1	--	--	--
S-4	08/25/93	11.0	40	0.031	0.059	0.066	0.29	--	--	--
S-5	08/25/93	11.0	1.4	<0.005	0.0063	0.0081	0.025	--	--	--
S-6	08/25/93	13.0	1,600	0.97	2.3	2.7	10	--	--	--
S-7	08/25/93	11.0	11,000	6.7	16	18	69	--	--	--
S-8	08/25/93	11.0	18,000	11	26	30	110	--	--	--
S-9	08/25/93	11.0	6,200	3.7	8.7	10	37	--	--	--
DS-1	08/25/93	1.0	0.013	0.0070	0.017	0.021	0.072	--	--	--
DS-2	08/25/93	1.0	0.0020	0.0053	0.0089	0.012	0.031	--	--	--
DS-3	08/25/93	1.0	0.0013	<0.0050	0.0059	0.0061	0.018	--	--	--
DS-4	08/25/93	1.0	0.0027	0.0055	0.0094	0.016	0.047	--	--	--
DS-5	08/25/93	1.0	0.0034	0.0059	0.011	0.018	0.061	--	--	--
DS-6	08/25/93	1.0	0.011	0.0068	0.015	0.018	0.064	--	--	--
VSW-1	08/25/93	6.0	4,800	2.9	7.0	8.0	30	--	--	--
VSW-2	08/25/93	6.0	0.021	0.15	0.29	0.33	1.3	--	--	--
1991 Soil Borings										
SB1-6-6.5	2/21/1991	6.0	11	0.014	0.37	0.22	1.2	--	--	--
SB1-10.5-11	2/21/1991	10.5	4.6	0.15	0.5	0.13	0.68	--	--	--
SB1-15.5-16	2/21/1991	15.5	7.5	2.1	1.8	0.18	1.1	--	--	--
SB2-6-6.5	2/21/1991	6.0	<1.0	<.0050	<.0050	<.0050	0.034	--	--	--
SB2-10.5-11	2/21/1991	10.5	1.8	0.062	0.038	0.035	0.085	--	--	--
SB2-15.5-16	2/21/1991	15.5	6.1	1.2	1.4	0.15	0.8	--	--	--
SB3-6-6.5	2/21/1991	6.0	<1.0	0.038	0.0054	0.015	0.034	--	--	--
SB3-10.5-11	2/21/1991	10.5	1,600	18	98	35	190	--	--	--
SB3-15.5-16	2/21/1991	15.5	2.4	0.31	0.21	0.064	0.35	--	--	--

ATTACHMENT C

Tank Protect Engineering's 1991 and 1993 Site Plans

URS

Thu Mar 24 08:53:09 2005

GEOTECHNICAL LABORATORY TEST DATA

Project : STL San Francisco 2005-03-0658
Project No. : 26813664.00000
Boring No. : GS-03
Sample No. : 8
Location : SAP #120403 207-0233-007
Soil Description : Brown silty sand
Remarks :

Depth : NA
Test Date : 03/24/2005
Test Method : ASTM D422

Filename : GS-03-08
Elevation : NA
Tested by : S. Capps
Checked by : R. Taraya

COARSE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	0.83	0.83	100
#10	0.079	2.00	0.45	1.28	100
#16	0.047	1.19	0.24	1.52	100
#30	0.023	0.60	0.53	2.05	100
#50	0.012	0.30	80.57	82.62	82
#100	0.006	0.15	203.53	286.15	37
#200	0.003	0.07	35.70	321.85	29

Total Dry Weight of Sample = 456.3

D85 : 0.3338 mm
D60 : 0.2110 mm
D50 : 0.1810 mm
D30 : 0.0776 mm
D15 : N/A
D10 : N/A

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-2-4(0)
AASHTO Group Name : Silty Gravel and Sand

URS

GEOTECHNICAL LABORATORY TEST DATA

Project : STL San Francisco 2005-03-0658
Project No. : 26813664.00000
Boring No. : GS-03
Sample No. : 5
Location : SAP #120403 207-0233-007
Soil Description : Brown silty sand
Remarks :

Depth : NA
Test Date : 03/24/2005
Test Method : ASTM D422

Filename : GS-03-05
Elevation : NA
Tested by : S. Capps
Checked by : R. Taraya

COARSE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
1"	1.012	25.70	0.00	0.00	100
0.75"	0.748	19.00	50.11	50.11	93
0.5"	0.500	12.70	11.58	61.69	92
0.375"	0.374	9.51	10.66	72.35	90
#4	0.187	4.75	17.44	89.79	88
#10	0.079	2.00	14.15	103.94	86
#16	0.047	1.19	6.39	110.33	85
#30	0.023	0.60	6.25	116.58	84
#50	0.012	0.30	143.22	259.80	64
#100	0.006	0.15	305.30	565.10	23
#200	0.003	0.07	51.75	616.85	16

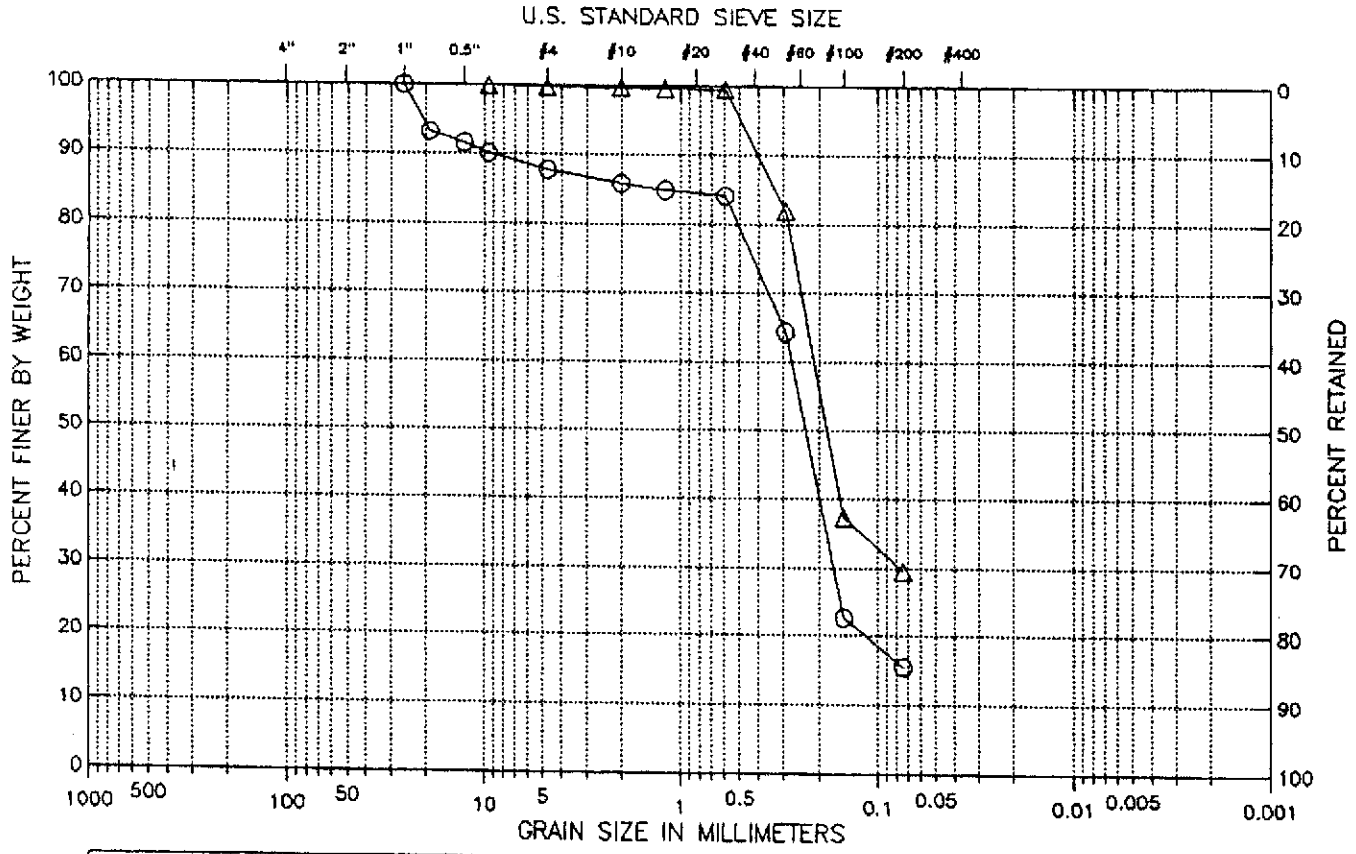
Total Dry Weight of Sample = 730.2

D85 : 1.2699 mm
D60 : 0.2744 mm
D50 : 0.2331 mm
D30 : 0.1681 mm
D15 : N/A
D10 : N/A

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

URS

Project : STL San Francisco 2005-03-0658
Project No.: 26813664.00000
Location: SAP #120403 207-0233-007
Date : Thu Mar 24 2005



Symbol	Boring No.	Sample No.	Depth	Filename	Classification / Description
⊖	GS-03	5	NA	GS-03-05	Brown silty sand
△	GS-03	8	NA	GS-03-08	Brown silty sand

Figure 1

URS

Thu Mar 24 10:07:18 2005

GEOTECHNICAL LABORATORY TEST DATA

Project : STL San Francisco 2005-03-0658
Project No. : 26813664.00000
Boring No. : GS-02
Sample No. : 8
Location : SAP #120403 207-0233-007
Soil Description : Brown silty sand with gravel
Remarks :

Depth : NA
Test Date : 03/24/2005
Test Method : ASTM D422

Filename : GS-02-08
Elevation : NA
Tested by : S. Capps
Checked by : R. Taraya

COARSE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
1.5"	1.500	38.10	0.00	0.00	100
1"	1.012	25.70	63.07	63.07	97
0.75"	0.748	19.00	90.72	153.79	93
0.5"	0.500	12.70	219.21	373.00	84
0.375"	0.374	9.51	203.40	576.40	76
#4	0.187	4.75	348.45	924.85	61
#10	0.079	2.00	364.85	1289.70	45
#16	0.047	1.19	179.00	1468.70	38
#30	0.023	0.60	156.00	1624.70	31
#50	0.012	0.30	145.50	1770.20	25
#100	0.006	0.15	132.90	1903.10	20
#200	0.003	0.07	90.90	1994.00	16

Total Dry Weight of Sample = 2365

D85 : 13.1332 mm
D60 : 4.5177 mm
D50 : 2.5787 mm
D30 : 0.5129 mm
D15 : N/A
D10 : N/A

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

URS

Thu Mar 24 09:41:23 2005

GEOTECHNICAL LABORATORY TEST DATA

Project : STL San Francisco 2005-03-0658
Project No. : 26813664.00000
Boring No. : GS-02
Sample No. : 5
Location : SAP #120403 207-0233-007
Soil Description : Brown silty sand with gravel
Remarks :

Filename : GS-02-05
Depth : NA
Test Date : 03/24/2005
Test Method : ASTM D422
Elevation : NA
Tested by : S. Capps
Checked by : R. Taraya

COARSE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
1.5"	1.500	38.10	0.00	0.00	100
1"	1.012	25.70	45.53	45.53	98
0.75"	0.748	19.00	71.64	117.17	95
0.5"	0.500	12.70	100.93	218.10	91
0.375"	0.374	9.51	144.15	362.25	86
#4	0.187	4.75	385.75	748.00	71
#10	0.079	2.00	485.70	1233.70	52
#16	0.047	1.19	223.30	1457.00	43
#30	0.023	0.60	197.00	1654.00	35
#50	0.012	0.30	167.80	1821.80	29
#100	0.006	0.15	156.90	1978.70	23
#200	0.003	0.07	125.85	2104.55	18

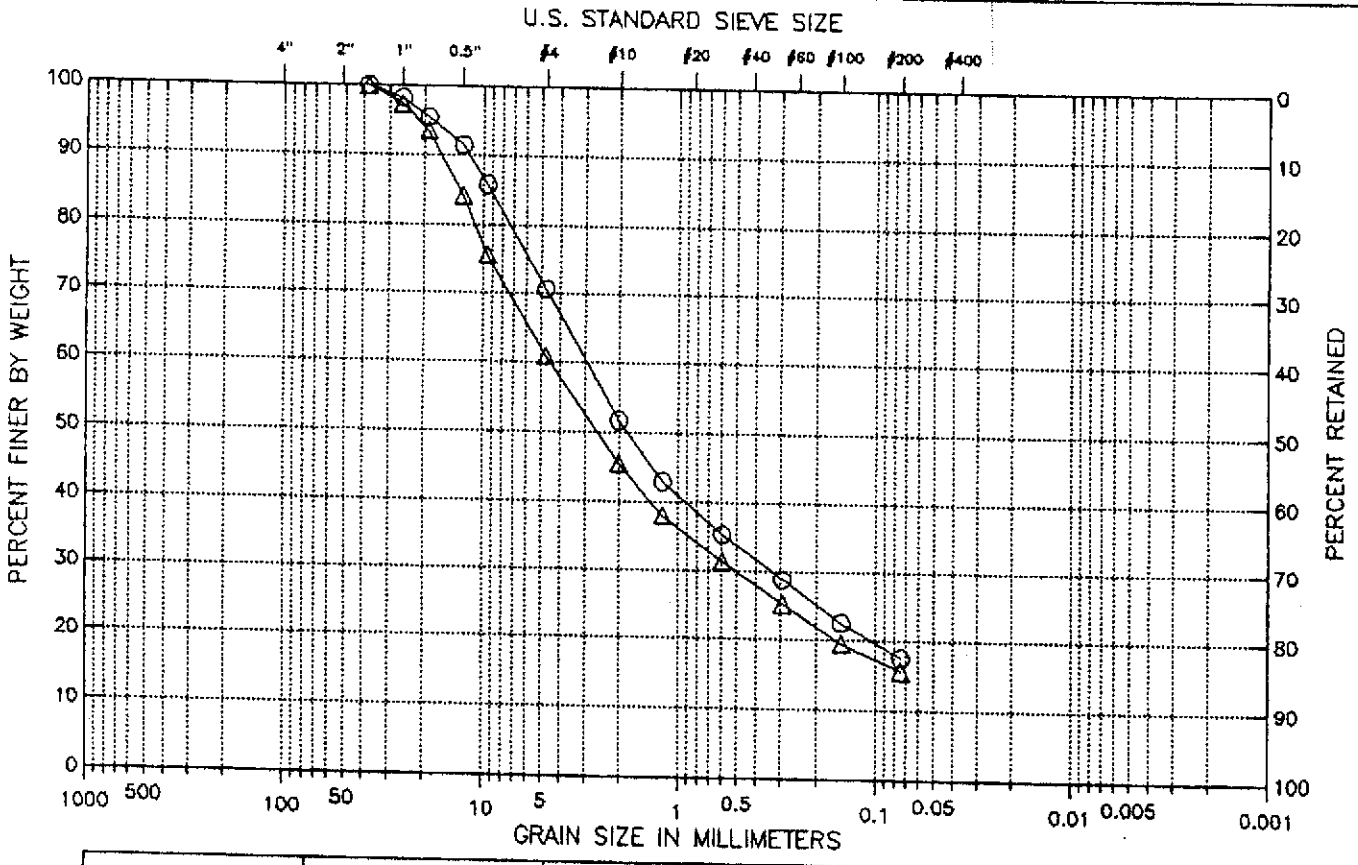
Total Dry Weight of Sample = 2555.3

D85 : 9.1566 mm
D60 : 2.9153 mm
D50 : 1.8057 mm
D30 : 0.3388 mm
D15 : N/A
D10 : N/A

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

URS

Project : STL San Francisco 2005-03-0658
Project No.: 26813664.00000
Location: SAP #120403 207-0233-007
Date : Thu Mar 24 2005



Symbol	Boring No.	Sample No.	Depth	Filename	Classification / Description
⊖	GS-02	5	NA	GS-02-05	Brown silty sand with gravel
△	GS-02	8	NA	GS-02-08	Brown silty sand with gravel

Figure 1

URS

Thu Mar 24 09:18:12 2005

GEOTECHNICAL LABORATORY TEST DATA

Project : STL San Francisco 2005-03-0658
Project No. : 26813664.00000 Depth : NA
Boring No. : GS-01 Test Date : 03/24/2005
Sample No. : 8 Test Method : ASTM D422
Location : SAP #120403 207-0233-007
Soil Description : Brown silty sand
Remarks :

Filename : GS-01-08
Elevation : NA
Tested by : S. Capps
Checked by : R. Taraya

COARSE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
#10	0.079	2.00	0.00	0.00	100
#16	0.047	1.19	0.08	0.08	100
#30	0.023	0.60	0.47	0.55	100
#50	0.012	0.30	119.40	119.95	82
#100	0.006	0.15	343.45	463.40	31
#200	0.003	0.07	50.95	514.35	24

Total Dry Weight of Sample = 673

D85 : 0.3298 mm
D60 : 0.2192 mm
D50 : 0.1918 mm
D30 : 0.1340 mm
D15 : N/A
D10 : N/A

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

URS

GEOTECHNICAL LABORATORY TEST DATA

Project : STL San Francisco 2005-03-0658
Project No. : 26813664.00000
Boring No. : GS-01
Sample No. : 5
Location : SAP #120403 207-0233-007
Soil Description : Brown silty sand
Remarks :

Filename : GS-01-05
Depth : NA
Test Date : 03/24/2005
Test Method : ASTM D422
Elevation : NA
Tested by : S. Capps
Checked by : R. Taraya

COARSE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	4.10	4.10	99
#10	0.079	2.00	6.55	10.65	99
#16	0.047	1.19	2.38	13.03	98
#30	0.023	0.60	3.00	16.03	98
#50	0.012	0.30	147.90	163.93	78
#100	0.006	0.15	352.07	516.00	30
#200	0.003	0.07	62.30	578.30	21

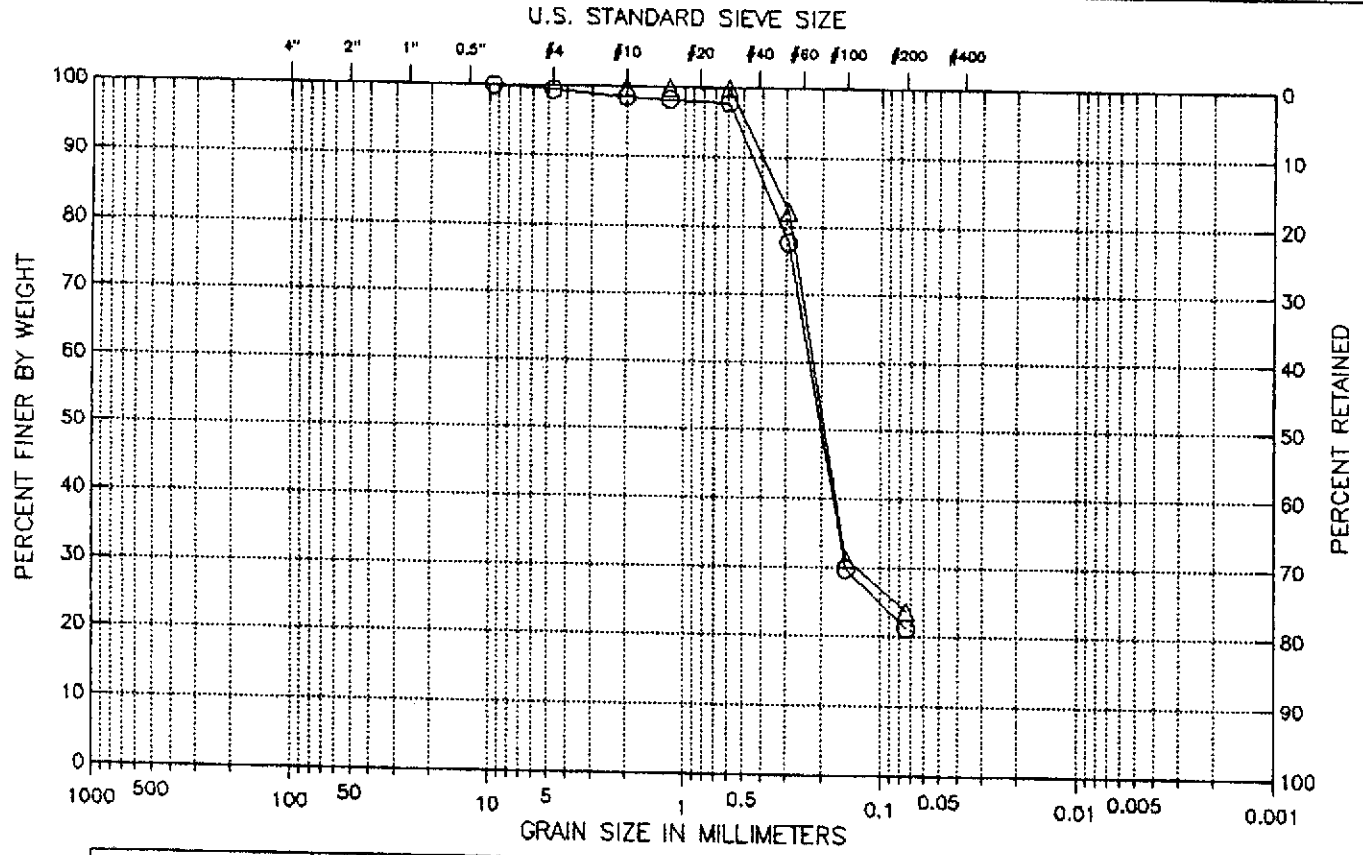
Total Dry Weight of Sample = 734.1

D85 : 0.3808 mm
D60 : 0.2294 mm
D50 : 0.1989 mm
D30 : 0.1496 mm
D15 : N/A
D10 : N/A

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

URS

Project : STL San Francisco 2005-03-0658
Project No.: 26813664.00000
Location: SAP #120403 207-0233-007
Date : Thu Mar 24 2005



Symbol	Boring No.	Sample No.	Depth	Filename	Classification / Description
⊖	GS-01	5	NA	GS-01-05	Brown silty sand
△	GS-01	8	NA	GS-01-08	Brown silty sand

Figure 1

SHELL Chain Of Custody Record

103452

STL - Pleasanton

2795 2nd Street, Suite 300

Davis, CA 95616

(530) 297-4800 (530) 297-4808 fax

Shell Project Manager to be invoiced:

☐ SCIENCE & TECHNOLOGY

☑ TECHNICAL SERVICES

☐ CRMT (DOWNSTREAM)

Bill Merchant

2005-03-0658

INCIDENT NUMBER (S&E ONLY)

DATE: 3/18/05

SAP or CRMT NUMBER (TS/CRMT): 1 2 0 4 0 3

PAGE 1 of 1

CONSULTANT NAME: CAMBRIA ENVIRONMENTAL TECHNOLOGY INC

SITE ADDRESS (Street and City): 1230 14th Street, Oakland, California

SHELL #: T0607571586

ADDRESS: 5900 HOLLIS ST, Suite A, Emeryville, CA 94608

E-MAIL: shelloaklander@cambria-env.com

FAX: 207-0233-007

TELEPHONE: 510-420-9170

E-MAIL: mwills@cambria-env.com

LAB USE ONLY

TURNAROUND TIME (BUSINESS DAYS): ☐ 10 DAYS ☐ 7 DAYS ☑ 72 HOURS ☐ 48 HOURS ☐ 24 HOURS ☐ LESS THAN 24 HOURS

☐ EDF REPORT FORMAT ☐ UST AGENCY: _____

GLOBAL ID CONFIRMATION: HIGHEST _____ HIGHEST per BORING _____ ALL _____

SPECIAL INSTRUCTIONS OR NOTES: COMPOSITE LAB SAMPLES? ☐

3-day TAT for the grain-size analysis and soil samples

REQUESTED ANALYSIS

LAB USE ONLY	Field Sample Identification	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT	TPH - Purgeable	TPH - Extractable (8015m)	BTEX	MTBE	TBA	5 Oxygenates	1,2 DCA and EDB	Ethanol	Methanol	VOCs by 8260B	Semi-Volatiles by 8270C	Lead ☐ Total ☐ DISS ☐ TCLP	LUFTS ☐ Total ☐ SHLC ☐ TCLP	CAM17 ☐ Total ☐ DISS ☐ TCLP	Test for Disposal (See Attached)	TAME	GRAIN-SIZE ANALYSIS		TEMPERATURE ON RECEIPT C°
	GS-02-5	3/18	1230	SOIL	1																	X		TO LABS
	GS-01-5		1391		1																	X		
	GS-03-5		1345		1																	X		
	GS-01-8		1401		1																	X		
	GS-02-8		1426		1																	X		
	GS-03-8		1450		1																	X		

Relinquished by (Signature)	Received by (Signature)	Date	Time
	Secured location	3/18/05	4:30 pm
Relinquished by (Signature)	Received by (Signature)	Date	Time
Joshua J. McGlashan	Han Wong	3/18/05	5:20 pm
Relinquished by (Signature)	Received by (Signature)	Date	Time
Han Wong	[illegible]	3/18/05	18:45 pm

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Laboratory Multi-Lab COC Templates .xls]STL

SEVERN TRENT STL

Submission#: 2005-03-0658

Cambria Environmental Emeryville

March 24, 2005

5900 Hollis Street, Ste. A
Emeryville, CA 94608

Attn.: Martin Wills

Project#: 207-0233-007
Project: SAP #120403
Site: 1230 14th Street, Oakland, California

Attached is our report for your samples received on 03/18/2005 17:20
This report has been reviewed and approved for release. Reproduction of this report is permitted only in its entirety.

Please note that any unused portion of the samples will be discarded after 05/02/2005 unless you have requested otherwise.
We appreciate the opportunity to be of service to you. If you have any questions,

You can also contact me via email. My email address is: mbrewer@stl-inc.com

Sincerely,

Melissa Brewer

Melissa Brewer
Project Manager

ATTACHMENT B

Laboratory Report for Grain Size Analysis

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-6633 James Yoo
FAX (510) 782-1939 www.acfcwcd.org

APPLICANTS: PLEASE ATTACH A SITE MAP FOR ALL DRILLING PERMIT APPLICATIONS
DESTRUCTION OF WELLS OVER 45 FEET REQUIRES A SEPARATE PERMIT APPLICATION

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 1230 14TH STREET
OAKLAND, CA

CLIENT
Name SHELL OIL PRODUCTS USA
Address 20945 WILMINGTON Phone
City CARSON Zip

APPLICANT
Name MARTIN WELLS
CAMBRIA ENV. Fax 510.420.9170
Address 5900 HOLLIS Phone 510.420.3342
City EMERYVILLE Zip

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	☐	General	☒ CHANGE SIZE
Water Supply	☐	Contamination	☐
Monitoring	☐	Well Destruction	☐

PROPOSED WATER SUPPLY WELL USE NONE

New Domestic	☐	Replacement Domestic	☐
Municipal	☐	Irrigation	☐
Industrial	☐	Other	☐

DRILLING METHOD:

Mud Rotary	☐	Air Rotary	☐	Auger	☐
Cable	☐	Other	☒ GEOPROBE		

DRILLER'S NAME VIRONEX

DRILLER'S LICENSE NO. 705927

WELL PROJECTS
Drill Hole Diameter ___ in. Maximum
Casing Diameter ___ in. Depth ___ ft.
Surface Seal Depth ___ ft Owner's Well Number ___

GEOTECHNICAL/CONTAMINATION PROJECTS
Number of Borings 3 Maximum
Hole Diameter 2 in. Depth 12 ft.

STARTING DATE 3/18/05
COMPLETION DATE 3/18/05

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE [signature] DATE 3/10/05

PLEASE PRINT NAME MARTIN WELLS Rev.5-11-04

FOR OFFICE USE

PERMIT NUMBER WR05-0323
WELL NUMBER
APN

PERMIT CONDITIONS
Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources-Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date

B. WATER SUPPLY WELLS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL/CONTAMINATION
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compatible material.

E. CATHODIC
Fill hole above zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS -B #1

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED [signature] DATE 3/4/05

Cambria Environmental Technology, Inc.
5900 Hollis Street, Suite A
Emeryville, California 94608
Telephone: (510) 420-0700
Fax: (510) 420-9170

BORING/WELL LOG

CLIENT NAME	Shell Oil Products US	**BORING/WELL NAME**	GS-03
JOB/SITE NAME	Shell-branded Service Station	**DRILLING STARTED**	18-Mar-05
LOCATION	1230 14th Street, Oakland, California	**DRILLING COMPLETED**	18-Mar-05
PROJECT NUMBER	247-0233	**WELL DEVELOPMENT DATE (YIELD)**	NA
DRILLER	Vironex	**GROUND SURFACE ELEVATION**	
DRILLING METHOD	Hydraulic push	**TOP OF CASING ELEVATION**	NA
BORING DIAMETER	2"	**SCREENED INTERVAL**	NA
LOGGED BY	M. Wills	**DEPTH TO WATER (First Encountered)**	NA ▽
REVIEWED BY	M. Derby, PE# 55475	**DEPTH TO WATER (Static)**	NA ▼
REMARKS	Hand augered to 5 fbg.		

PID (ppm)	TPHg (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (ft bgs)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (ft bgs)	WELL DIAGRAM
			GS-03 -05		5	SM		**Silty SAND** (SM); dark brown; damp; 15% silt, 85% fine sand; low plasticity.	8.0	Portland Type I/II Cement
			GS-03 -08							Bottom of Boring @ 8 ft

WELL LOG (PID/TPHG) G:\OAC886~1\GINT\OK-1230.GPJ DEFAULT.GDT 3/24/05

Cambria Environmental Technology, Inc.
5900 Hollis Street, Suite A
Emeryville, California 94608
Telephone: (510) 420-0700
Fax: (510) 420-9170

BORING/WELL LOG

CLIENT NAME	Shell Oil Products US	**BORING/WELL NAME**	GS-02
JOB/SITE NAME	Shell-branded Service Station	**DRILLING STARTED**	18-Mar-05
LOCATION	1230 14th Street, Oakland, California	**DRILLING COMPLETED**	18-Mar-05
PROJECT NUMBER	247-0233	**WELL DEVELOPMENT DATE (YIELD)**	NA
DRILLER	Vironex	**GROUND SURFACE ELEVATION**	
DRILLING METHOD	Hydraulic push	**TOP OF CASING ELEVATION**	NA
BORING DIAMETER	2"	**SCREENED INTERVAL**	NA
LOGGED BY	M. Wills	**DEPTH TO WATER (First Encountered)**	NA
REVIEWED BY	M. Derby, PE# 55475	**DEPTH TO WATER (Static)**	NA
REMARKS	Hand augered to 5 fbg.		

PID (ppm)	TPHg (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (ft bgs)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (ft bgs)	WELL DIAGRAM
			GS-02 -05		5			**FILL**; brown; dry; 10% clay, 15% silt, 30% sand, 60% angular fine to medium gravel; no plasticity.	8.0	Portland Type I/II Cement
			GS-02 -08							Bottom of Boring @ 8 ft

WELL LOG (PID/TPHG) G:\OAC886-1\GINT\OK-1230.GPJ DEFAULT.GDT 3/24/05

Cambria Environmental Technology, Inc.
5900 Hollis Street, Suite A
Emeryville, California 94608
Telephone: (510) 420-0700
Fax: (510) 420-9170

BORING/WELL LOG

CLIENT NAME	Shell Oil Products US	**BORING/WELL NAME**	GS-01
JOB/SITE NAME	Shell-branded Service Station	**DRILLING STARTED**	18-Mar-05
LOCATION	1230 14th Street, Oakland, California	**DRILLING COMPLETED**	18-Mar-05
PROJECT NUMBER	247-0233	**WELL DEVELOPMENT DATE (YIELD)**	NA
DRILLER	Vironex	**GROUND SURFACE ELEVATION**	
DRILLING METHOD	Hydraulic push	**TOP OF CASING ELEVATION**	NA
BORING DIAMETER	2"	**SCREENED INTERVAL**	NA
LOGGED BY	M. Wills	**DEPTH TO WATER (First Encountered)**	NA ▽
REVIEWED BY	M. Derby, PE# 55475	**DEPTH TO WATER (Static)**	NA ▼
REMARKS	Hand augered to 5 fbg.		

PID (ppm)	TPHg (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (ft bgs)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (ft bgs)	WELL DIAGRAM
								Asphalt.	0.5	Portland Type I/II Cement
			GS-01 -05		5	SM		**Silty SAND** (SM); brown; damp; 35% silt, 65% fine to medium grained sand; no plasticity; moderate estimated permeability.		
			GS-01 -08						8.0	Bottom of Boring @ 8 ft

WELL LOG (PID/TPHG) G:\OAC886-1\GINT\OK-1230.GPJ DEFAULT.GDT 3/24/05

ATTACHMENT A

Soil Boring Logs and Permit

Table 9. Merritt Sands Oakland Tier 2 SSTLs

Medium	Exposure Pathway	Land Use	Type of Risk	Benzene	Ethyl-benzene	Toluene	Xylenes
Surficial Soil [mg/kg]	Ingestion/ Dermal/ Inhalation	Residential	Carcinogenic	3.7E+01			
			Hazard	9.9E+01	6.3E+03	1.1E+04	6.0E+04
		Commercial/ Industrial	Carcinogenic	1.5E+02			
			Hazard	9.2E+02	6.3E+04	9.4E+04	3.8E+05
Subsurface Soil [mg/kg]	Inhalation of Indoor Air Vapors	Residential	Carcinogenic	7.0E-01			
			Hazard	2.3E+00	SAT	3.7E+02	SAT
		Commercial/ Industrial	Carcinogenic	1.1E+01			
			Hazard	6.7E+01	SAT	SAT	SAT
	Inhalation of Outdoor Air Vapors	Residential	Carcinogenic	3.9E+00			
			Hazard	1.6E+01	SAT	SAT	SAT
		Commercial/ Industrial	Carcinogenic	1.5E+01			
			Hazard	9.1E+01	SAT	SAT	SAT
	Ingestion of Groundwater Impacted by Leachate	Residential	Carcinogenic	*1.0E-02*	*3.8E+01*	*4.2E+00*	*6.4E+01*
			Hazard	*1.0E-02*	*3.8E+01*	*4.2E+00*	*6.4E+01*
		Commercial/ Industrial	Carcinogenic	*1.0E-02*	*3.8E+01*	*4.2E+00*	*6.4E+01*
			Hazard	*1.0E-02*	*3.8E+01*	*4.2E+00*	*6.4E+01*
Groundwater [mg/l]	Inhalation of Indoor Air Vapors	Residential	Carcinogenic	1.4E+00			
			Hazard	4.7E+00	>SOL	2.8E+02	>SOL
		Commercial/ Industrial	Carcinogenic	2.2E+01			
			Hazard	1.4E+02	>SOL	>SOL	>SOL
	Inhalation of Outdoor Air Vapors	Residential	Carcinogenic	1.8E+02			
			Hazard	7.2E+02	>SOL	>SOL	>SOL
		Commercial/ Industrial	Carcinogenic	6.9E+02			
			Hazard	>SOL	>SOL	>SOL	>SOL
	Ingestion of Groundwater	Residential	Carcinogenic	*1.0E-03*	*7.0E-01*	*1.5E-01*	*1.8E+00*
			Hazard	*1.0E-03*	*7.0E-01*	*1.5E-01*	*1.8E+00*
		Commercial/ Industrial	Carcinogenic	*1.0E-03*	*7.0E-01*	*1.5E-01*	*1.8E+00*
			Hazard	*1.0E-03*	*7.0E-01*	*1.5E-01*	*1.8E+00*
Water Used for Recreation [mg/l]	Ingestion/ Dermal	Residential	Carcinogenic	6.3E-02			
			Hazard	1.8E-01	3.6E+00	1.1E+01	6.6E+01

*Italicized concentrations based on California MCLs
SAT = RBSL exceeds saturated soil concentration of chemical
>SOL = RBSL exceeds solubility of chemical in water

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Oakland RBCA documents\[wksheet2.xls]RBSLs

TABLE 8 - REPRESENTATIVE GROUNDWATER CONCENTRATIONS

CAMBRIA

Former Shell Service Station, 1230 14th Street, Oakland, CA

Well ID	Date	TPPH (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
VW/MW-2	9/29/2003	12,000	860	980	410	1,100
VW/MW-2	10/29/2003	12,000	1,100	940	530	1,200
VW/MW-2	1/5/2004	190	<0.50	<0.50	<0.50	<1.0
VW/MW-2	4/1/2004	410	1.4	0.54	1.6	1.0
VW/MW-2	7/2/2004	5,500	440	370	170	410
VW/MW-2	11/3/2004	3,800	260	210	150	600
VW/MW-2	**1/4/2005**	**280**	**5.8**	**20**	**7.8**	**26**
VW/MW-4	9/29/2003	7,500	1800	300	390	860
VW/MW-4	10/29/2003	10,000	2600	400	510	1,200
VW/MW-4	1/5/2004	1,000	70	12	30	56
VW/MW-4	4/1/2004	1,000	64	7.0	22	18
VW/MW-4	7/2/2004	5,600	1,500	57	380	180
VW/MW-4	11/3/2004	9,400	2,400	210	560	890
VW/MW-4	**1/4/2005**	**110**	**12**	**<0.50**	**2.3**	**<1.0**
VW/AS-1	9/29/2003	9,600	2,300	100	1,200	670
VW/AS-1	10/29/2003	10,000	2,000	39	1,000	370
VW/AS-1	1/5/2004	2,000	710	18	410	18
VW/AS-1	4/1/2004	27,000	9,100	1,200	2,200	1,400
VW/AS-1	7/2/2004	18,000	6,500	170	1,200	1,200
VW/AS-1	11/3/2004	4,500	1,700	23	280	55
VW/AS-1	**1/4/2005**	**7,500**	**2,500**	**74**	**540**	**110**
VW/AS-3	9/29/2003	160	54	2.2	6.9	8.7
VW/AS-3	10/29/2003	350	16	<0.50	1.1	<1.0
VW/AS-3	1/5/2004	2,700	870	39	130	250
VW/AS-3	4/1/2004	1,300	240	4.1	36	45
VW/AS-3	7/2/2004	610	59	<1.0	3.6	<2.0
VW/AS-3	11/3/2004	200	<0.50	<0.50	<0.50	<1.0
VW/AS-3	**1/4/2005**	**2,500**	**730**	**42**	**36**	**190**

95% Upper Confidence Limit of the Mean	**1,167.54**	**798.77**	**1,960.35**	**155.75**	**1,113.20**

Calculated using Pro UCL 3.00.02
EPA/600/R04/079 April 2004

NOTES:

For risk assessment, non-detected results are assumed to be equal to their detection limits.

TPPH = Total petroleum hydrocarbons as gasoline by EPA Method 8260B; prior to April 27, 2001, analyzed by EP

BTEX = benzene, toluene, ethylbenzene, xylenes by EPA Method 8260B; prior to April 27, 2001, analyzed by EPA

MTBE = Methyl-tertiary-butyl ether

TOC = Top of Casing Elevation

GW = Groundwater

DO = Dissolved Oxygen

NA = Not applicable

ug/L = Parts per billion

ft = Feet

<n = Below detection limit

TABLE 8 - REPRESENTATIVE GROUNDWATER CONCENTRATIONS

CAMBRIA

Former Shell Service Station, 1230 14th Street, Oakland, CA

Well ID	Date	TPPH (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
MW-1	9/29/2003	10,000	5,700	400	670	1,000
MW-1	10/29/2003	19,000	6,600	560	820	1,300
MW-1	1/5/2004	380	140	7.1	6.2	16
MW-1	4/1/2004	79	0.59	<0.50	<0.50	<1.0
MW-1	7/2/2004	4,100	2,100	33	110	81
MW-1	11/3/2004	8,000	3,800	150	480	460
MW-1	**1/4/2005**	**120**	**23**	**1.6**	**2**	**3.5**
MW-2	9/29/2003	<50	<0.50	<0.50	<0.50	<1.0
MW-2	10/29/2003	<50	<0.50	<0.50	<0.50	<1.0
MW-2	1/5/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-2	4/1/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-2	7/2/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-2	11/3/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-2	**1/4/2005**	**<50**	**<0.50**	**<0.50**	**<0.50**	**<1.0**
MW-3	9/29/2003	<50	<0.50	<0.50	<0.50	<1.0
MW-3	10/29/2003	58	<0.50	<0.50	<0.50	<1.0
MW-3	1/5/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-3	4/1/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-3	7/2/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-3	11/3/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-3	**1/4/2005**	**<50**	**<0.50**	**<0.50**	**<0.50**	**<1.0**
MW-4	9/29/2003	<50	<0.50	<0.50	<0.50	<1.0
MW-4	10/29/2003	58	<0.50	<0.50	<0.50	<1.0
MW-4	1/5/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-4	4/1/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-4	7/2/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-4	11/3/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-4	**1/4/2005**	**<50**	**<0.50**	**<0.50**	**<0.50**	**<1.0**
MW-5	9/29/2003	59,000	6,600	4,200	1,500	6,500
MW-5	10/29/2003	45,000	6,800	3,500	1,500	6,400
MW-5	1/5/2004	26,000	4,900	1,700	1,100	3,300
MW-5	4/1/2004	29,000	5,300	2,700	880	2,900
MW-5	7/2/2004	19,000	5,300	740	1,100	1,400
MW-5	11/3/2004	31,000	7,500	2,300	1,400	4,400
MW-5	**1/4/2005**	**18,000**	**3,500**	**1,200**	**730**	**2,300**
MW-6	9/29/2003	910	46	<2.5	<2.5	<5.0
MW-6	10/29/2003	830	38	0.53	<0.50	3.3
MW-6	1/5/2004	93	0.92	<0.50	<0.50	<1.0
MW-6	4/1/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-6	7/2/2004	370	3	<0.50	<0.50	<1.0
MW-6	11/3/2004	540	22	0.73	<0.50	1.5
MW-6	**1/4/2005**	**<50**	**<0.50**	**<0.50**	**<0.50**	**<1.0**
MW-7	9/29/2003	5,200	1,200	<10	<10	<20
MW-7	10/29/2003	4,800	1,100	<5.0	<5.0	<10
MW-7	1/5/2004	53	6.7	<0.50	<0.50	<1.0
MW-7	4/1/2004	<50	<0.50	<0.50	<0.50	<1.0
MW-7	7/2/2004	8,100	3,400	<25	<25	<25
MW-7	11/3/2004	3,700	1,200	<5.0	<5.0	<10
MW-7	**1/4/2005**	**<50**	**2**	**<0.50**	**<0.50**	**<1.0**

Table 7 - Representative Subsurface Soil Analytical Results - Former Shell-branded Service Station, 1230 14th St. Oakland, California - Incident #97088250

Sample ID	Date	Depth (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes
			← (ppm) →				
SB-F(VW/AS)-1-5.5	3/7/1996	5.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025
SB-F(VW/AS-1)-10.5	03/07/96	10.5	**62**	**0.97**	**4.2**	**1.4**	**8.0**
SB-G(VW/MW-2)-8.5	3/7/1996	8.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025
SB-G(VW/MW-2)-10.5	03/07/96	10.5	<1.0	**0.0032**	<0.0025	<0.0025	<0.0025
SB-H(VW/AS-3)-8.5	3/7/1996	8.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025
SB-H(VW/AS-3)-10.5	03/07/96	10.5	<1.0	**0.018**	<0.0025	<0.0025	**0.014**
SB-I(VW/MW-4)-5.5	3/8/1996	5.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025
SB-I(VW/MW-4)-8.5	3/8/1996	8.5	**80**	**0.14**	**0.33**	**1.3**	**5.2**
SB-J-10.5	03/08/96	10.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025
TS-1-4.0	11/27/1995	4	<1.0	<0.0050	**0.005**	<0.0050	<0.0050
S-1	8/25/1993	8.5	**67**	**0.038**	**0.089**	**0.110**	**0.380**
95% Upper Confidence Limit of the Mean			**201.08**	**0.57**	**4.73**	**2.95**	**30.44**

Calculated using Pro UCL 3.00.02
EPA/600/R04/079 April 2004

Notes:

For risk assessment, non-detected results are assumed to be equal to their detection limits.

ppm = parts per million (milligrams per kilogram).

TPHg = Total Petroleum Hydrocarbons as gasoline, analyzed by EPA Method 8015 or 8260B.

TPHd = Total Petroleum Hydrocarbons as diesel, analyzed by EPA Method 8015.

Benzene, toluene, ethylbenzene, and xylene analyzed by EPA Method 8020 or 8260B.

MTBE = Methyl tertiary butyl ether, analyzed by EPA Method 8020 or 8260B.

Petroleum oil and grease (POG) by Standard Method 5520.

-- = Not sampled
ppm=parts per million
<x=not detected above x ppm

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\[Cumulative 1230 14th Soil & GW Summary.xls]Table7-Subsurf Soil TPHg&BTEX

Table 7 - Representative Subsurface Soil Analytical Results - Former Shell-branded Service Station, 1230 14th St. Oakland, California - Incident #97088250

Sample ID	Date	Depth (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes
			← (ppm) →				
S-18-4	11/7/2003	4	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-18-9	11/7/2003	9	**1,800**	**4.0**	**35**	**21**	**150**
S-19-4	11/7/2003	4	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-19-8	11/7/2003	8	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-19-9	11/7/2003	9	**3.5**	<0.0050	<0.0050	<0.0050	<0.0050
S-20-9	11/7/2003	9	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-21-4	11/7/2003	4	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-21-9	11/7/2003	9	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-21-11	11/7/2003	11	**680**	<0.50	<0.50	**4.4**	**14**
S-10 5.0-5.5	6/7/2002	5.0	<1.0	<0.005	<0.005	<0.005	<0.005
S-10 8.5-9.0	6/7/2002	8.5	<1.0	<0.005	<0.005	<0.005	<0.005
S-10 10-10.5	6/7/2002	10.0	<1.0	<0.005	<0.005	<0.005	<0.005
S-11 5-5.5	6/7/2002	5.0	<1.0	<0.005	<0.005	<0.005	<0.005
S-11 7.5-8	6/7/2002	7.5	<1.0	<0.005	<0.005	<0.005	<0.005
S-11 10.5-11	6/7/2002	10.5	<1.0	<0.005	<0.005	<0.005	<0.005
S-12 5-5.5	6/7/2002	5.0	<1.0	<0.005	<0.005	<0.005	<0.005
S-12 7.5-8	6/7/2002	7.5	<1.0	<0.005	<0.005	<0.005	<0.005
S-13 5-5.5	6/7/2002	5.0	<1.0	<0.005	<0.005	<0.005	<0.005
S-13 7.5-8	6/7/2002	7.5	<1.0	<0.005	<0.005	<0.005	<0.005
S-14 5.5-6	6/10/2002	5.5	<1.0	<0.005	<0.005	<0.005	<0.005
S-14 7.5-8	6/10/2002	7.5	<1.0	<0.005	<0.005	<0.005	<0.005
S-14 9-9.5	6/10/2002	9.0	<1.0	<0.005	<0.005	<0.005	<0.005
S-15 5-5.5	6/10/2002	5.0	<1.0	<0.005	<0.005	<0.005	**0.011**
S-15 7.5-8	6/10/2002	7.5	<1.0	<0.005	<0.005	<0.005	<0.005
S-15 10-10.5	6/10/2002	10.0	**2.3**	<0.005	<0.005	<0.005	<0.005
S-16 7.5-8	6/10/2002	7.5	<1.0	<0.005	<0.005	<0.005	<0.005
S-16 10-10.5	6/10/2002	10.0	<1.0	<0.005	<0.005	<0.005	<0.005
S-17 5-5.5	6/10/2002	5.0	<1.0	<0.005	<0.005	<0.005	<0.005
S-17 10-10.5	6/10/2002	10.0	<1.0	<0.005	<0.005	<0.005	<0.005
MW-5-9.5	9/27/2001	9.5	**3.9**	<0.0050	<0.0050	**0.0069**	**0.019**
GP-1-5	12/11/2000	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-1-10	12/11/2000	10.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-2-5	12/11/2000	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-2-10.5	12/11/2000	10.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-3-5	12/11/2000	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-3-10.0	12/11/2000	10.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-4-5	12/11/2000	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-4-10	12/11/2000	10.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-5-5	12/11/2000	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-5-10	12/11/2000	10.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
SB-A/(MW-1)-10.5	03/06/96	10.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025
SB-B/(MW-2)-10.5	3/6/1996	10.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025
SB-D/(MW-3)-10.5	03/06/96	10.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025
SB-E-10.5	3/6/1996	10.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025

Table 6 - Representative Surficial Soil Analytical Results - Former Shell-branded Service Station, 1230 14th St., Oakland, California
Incident #97088250

Sample ID	Date	Depth (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE
			←			(ppm)		
S-18 2.5-3	6/10/2002	2.5	<1.0	<.005	<.005	<.005	<.005	--
TS-2-2.0	11/27/1995	2	<1.0	<0.0050	0.0057	<0.0050	**0.0075**	--
TS-3-3.0	11/27/1995	3	<1.0	<0.0050	<0.0050	<0.0050	**0.0069**	--
TS-4-3.0	11/27/1995	3	<0.005	**0.011**	**0.038**	**0.0073**	**0.043**	--
TS-5-2.5	11/27/1995	2.5	**46**	<0.10	<0.10	<0.10	**2**	--
	Number	**5**						
	Maximum		**46**	**0.10**	**0.10**	**0.10**	**2**	

Notes:

For risk assessment, non-detected results are assumed to be equal to their detection limits.

ppm = parts per million (milligrams per kilogram).

TPHg = Total Petroleum Hydrocarbons as gasoline, analyzed by EPA Method 8015 or 8260B.

TPHd = Total Petroleum Hydrocarbons as diesel, analyzed by EPA Method 8015.

Benzene, toluene, ethylbenzene, and xylene analyzed by EPA Method 8020 or 8260B.

MTBE = Methyl tertiary butyl ether, analyzed by EPA Method 8020 or 8260B.

Petroleum oil and grease (POG) by Standard Method 5520.

-- = Not sampled
ppm=parts per million
<x=not detected above x ppm

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\[Cumulative 1230 14th Soil & GW Summary.xls]Table 6-Surfic Soil TPHg&BTEX

Table 5: Vapor Extraction - Mass Removal Data - Shell-branded Service Station, Incident #97088250, 1230 14th Street, Oakland, Califor

Abbreviations and Notes:

CFM = Cubic feet per minute

TPHg = Total petroleum hydrocarbons as gasoline (C6-C12) by modified EPA Method 8015 in 1 liter tedlar bag samples

ppmv = Parts per million by volume

= Pounds

NA = Not available

TPHG, Benzene, and MTBE analyzed by EPA Method 8015/8020 in 1 liter tedlar bag samples

TPHg / Benzene / MTBE removal rate = Rate based on Bay Area Air Quality Management District's Manual of Procedures for Soil Vapor Extraction dated July 17, 1991.

(Rate = Concentration (ppmv) x system flow rate (cfm) x (1lb-mole/386ft3) x molecular weight (86 lb/lb-mole for TPHg, 78 lb/lb-mole for benzene, 88 lb/lb-mole for MTBE) x 60 min/hour x 1/1,000,000)

Cumulative TPHg / Benzene / MTBE removal = Previous removal rate multiplied by the hour-interval of operation plus the previous total

If concentration is less than the laboratory detection limit, one half of the detection limit concentration is used in the mass removal calculation.

G:\Oakland 1230 14th\2003 Peroxide Injection\[Final Groundwater Data.xls]Rejuvenate Chem Inj. Summary

Table 5: Vapor Extraction - Mass Removal Data - Shell-branded Service Station, Incident #97088250, 1230 14th Street, Oakland, Califor

Date Purged	Well ID	Interval Hours of Operation (hours)	System Flow Rate (CFM)	Hydrocarbon Concentrations (Concentrations in ppmv) TPHg	Benzene	TPPH TPHg Removal Rate (#/hour)	TPPH Cumulative TPHg Removed (#)	Benzene Benzene Removal Rate (#/hour)	Benzene Cumulative Benzene Removed (#)
09/19/02	MW-5	4.00	10.1	150	25	0.020	0.081	0.003	0.012
10/01/02	MW-5	4.00	11.1	2,100	23	0.312	1.327	0.003	0.025
10/17/02	MW-5	4.00	9.3	1,100	20	0.137	1.874	0.002	0.034
11/01/02	MW-5	4.00	10.0	520	8.9	0.070	2.152	0.001	0.038
11/15/02	MW-5	4.00	8.5	1,500	16	0.170	2.834	0.002	0.045
12/03/02	MW-5	4.00	7.7	1,300	15	0.134	3.370	0.001	0.050
12/31/02	MW-5	4.25	10.9	560	13	0.082	3.716	0.002	0.057
01/17/03	MW-5	4.00	9.1	260	14	0.032	3.843	0.002	0.064
01/29/03	MW-5	4.08	13.4	340	12	0.061	4.091	0.002	0.072
02/04/03	MW-5	2.50	NA	190	1.1	0.000	4.091	0.000	0.072
02/18/03	MW-5	4.00	NA	56	0.29	0.000	4.091	0.000	0.072
03/04/03	MW-5	4.00	21.5	31	2.8	0.009	4.127	0.001	0.075
11/10/03	MW-5	4.75	10.3	890	8.2	0.123	4.709	0.001	0.079
12/12/03	MW-5	4.00	13.0	1,200	14	0.209	5.543	0.002	0.088
01/30/04	MW-5	4.00	12.9	48	2.5	0.008	5.576	0.000	0.090
02/26/04	MW-5	4.50	4.2	67	1.4	0.004	5.593	0.000	0.090
03/31/04	MW-5	4.92	20.7	26	2.3	0.007	5.629	0.001	0.093
04/28/04	MW-5	4.00	17.9	12	2.7	0.003	5.640	0.001	0.095
Total Pounds Removed:						**TPHg =**	**5.640**	**Benzene =**	**0.095**

Table 4: Groundwater Extraction - Mass Removal Data - Former Shell Service Station, Incident #97088250, 1230 14th St., Oakland, California

					TPPH			Benzene		
Date Purged	Well ID	Volume Pumped (gal)	Cumulative Volume Pumped (gal)	Date Sampled	TPPH Concentration (ppb)	TPPH Removed (pounds)	TPPH Removed To Date (pounds)	Benzene Concentration (ppb)	Benzene Removed (pounds)	Benzene Removed To Date (pounds)
04/28/04	MW-5	300	9,846	04/01/04	29,000	0.07260	5.50526	5,300	0.01327	0.47471
Total Gallons Extracted:			**9,846**		**Total Pounds Removed:**		**5.50526**			**0.47471**
					Total Gallons Removed:		**0.90250**			**0.06503**

Abbreviations & Notes:

TPPH = Total purgeable hydrocarbons as gasoline
ppb = Parts per billion
gal = Gallons
Mass removed based on the formula: volume extracted (gal) x concentration (µg/L) x (g/10^6µg) x (pound/453.6g) x (3.785 L/gal)
Volume removal data based on the formula: density (in gms/cc) x 9.339 (ccxlbs/gmsxgals)
TPPH and benzene analyzed by EPA Method 8260
Concentrations based on most recent groundwater monitoring results
If concentration is less than the laboratory detection limit, one half of the detection limit concentration is used in the mass removal calculation.
Groundwater extracted by vacuum trucks provided by Phillips Services. Water disposed of at a Martinez Refinery.

G:\Oakland 1230 14th\VacOps\[mass removal.xls]Oakland, 1230 14th - TFE

Table 4: Groundwater Extraction - Mass Removal Data - Former Shell Service Station, Incident #97088250, 1230 14th St., Oakland, California

					TPPH			Benzene		
Date Purged	Well ID	Volume Pumped (gal)	Cumulative Volume Pumped (gal)	Date Sampled	TPPH Concentration (ppb)	TPPH Removed (pounds)	TPPH Removed To Date (pounds)	Benzene Concentration (ppb)	Benzene Removed (pounds)	Benzene Removed To Date (pounds)
06/11/02	MW-5	300	300	04/17/02	33,000	0.08261	0.08261	3,800	0.00951	0.00951
06/25/02	MW-5	200	500	04/17/02	33,000	0.05507	0.13768	3,800	0.00634	0.01585
07/09/02	MW-5	415	915	04/17/02	33,000	0.11428	0.25196	3,800	0.01316	0.02901
07/23/02	MW-5	300	1,215	04/17/02	33,000	0.08261	0.33457	3,800	0.00951	0.03853
08/06/02	MW-5	300	1,515	04/17/02	33,000	0.08261	0.41718	3,800	0.00951	0.04804
08/20/02	MW-5	185	1,700	04/17/02	33,000	0.05094	0.46812	3,800	0.00587	0.05390
09/03/02	MW-5	151	1,851	04/17/02	33,000	0.04158	0.50970	3,800	0.00479	0.05869
09/19/02	MW-5	400	2,251	04/17/02	33,000	0.11015	0.61984	3,800	0.01268	0.07138
10/01/02	MW-5	375	2,626	04/17/02	33,000	0.10326	0.72311	3,800	0.01189	0.08327
10/17/02	MW-5	150	2,776	04/17/02	33,000	0.04130	0.76441	3,800	0.00476	0.08802
11/01/02	MW-5	327	3,103	04/17/02	33,000	0.09004	0.85445	3,800	0.01037	0.09839
11/15/02	MW-5	200	3,303	11/11/02	100,000	0.16689	1.02134	7,100	0.01185	0.11024
12/03/02	MW-5	200	3,503	11/11/02	100,000	0.16689	1.18823	7,100	0.01185	0.12209
12/31/02	MW-5	391	3,894	11/11/02	100,000	0.32626	1.51449	7,100	0.02316	0.14525
01/17/03	MW-5	463	4,357	11/11/02	100,000	0.38634	1.90084	7,100	0.02743	0.17268
01/29/03	MW-5	2,780	7,137	11/11/02	100,000	2.31973	4.22057	7,100	0.16470	0.33739
02/04/03	MW-5	250	7,387	11/11/02	100,000	0.20861	4.42918	7,100	0.01481	0.35220
02/18/03	MW-5	400	7,787	11/11/02	100,000	0.33377	4.76295	7,100	0.02370	0.37589
03/04/03	MW-5	350	8,137	11/11/02	100,000	0.29205	5.05500	7,100	0.02074	0.39663
11/10/03	MW-5	250	8,387	10/29/03	45,000	0.09387	5.14888	6,800	0.01419	0.41082
12/12/03	MW-5	204	8,591	10/29/03	45,000	0.07660	5.22548	6,800	0.01158	0.42239
01/30/04	MW-5	300	8,891	01/05/04	26,000	0.06509	5.29056	4,900	0.01227	0.43466
02/26/04	MW-5	400	9,291	01/05/04	26,000	0.08678	5.37735	4,900	0.01635	0.45101
03/31/04	MW-5	255	9,546	01/05/04	26,000	0.05532	5.43267	4,900	0.01043	0.46144

Table 3. Cleanup Levels and Cleanup Goals
Former Shell Service Station, Incident #97088250, 1230 14th Street, Oakland, CA

	Cleanup Level		Cleanup Goal	
Chemical of Concern	Soil[1] (ppm)	Groundwater[2] (ppb)	Soil[1] (ppm)	Groundwater (ppb)
Benzene	0.7	1,400	0.7	1[4]
Toluene	370	>Sol	370	150[4]
Ethylbenzene	SAT	>Sol	SAT	700[4]
Xylenes	SAT	>Sol	SAT	1750[4]
TPHg	400[3]	500[3]	400[3]	500[3]

Notes:
RBSL = Risk-Based Screening Level
[1] Oakland RBSL for volatilization of BTEX from groundwater into indoor air in a residential setting, for Merritt Sands
[2] Oakland RBSL for volatilization of BTEX from subsurface soil to indoor air in a residential setting, for Merritt Sands
[3] SF RWQCB RBSL Tier 1 Lookup Table D, Interim Final December 2001
[4] SF RWQCB Water Quality Objectives for Municipal Supply (June 1995 Basin Plan, Table 3-5)
SAT = RBSL exceeds the saturated soil concentration of the chemical
>Sol = RBSL exceeds solubility of chemical in water

Revised 3/4/03 per ACHCSA letter dated February 18, 2003

G:\Oakland 1230 14th\2003 Peroxide Injection\[Final Groundwater Data.xls]Cleanup Levels & Goals 3-4-03

Table 2: Groundwater Analytical Results - Former Shell-branded Service Station, 1230 14th St., Oakland, California
Incident #97088250

Sample ID	Date	Depth to Water (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE
			←			(ppb)	→	
November 2003 Post-Peroxide Injection Sampling								
S-18	11/7/2003	~12.5	**75,000**	**3,600**	**10,000**	**2,200**	**12,000**	--
S-19	11/7/2003	~12.5	**18,000**	**540**	**980**	**480**	**2,300**	--
S-20	11/7/2003	~12.5	**1,500**	**1,100**	**15**	**66**	**38**	--
S-21	11/7/2003	~12.5	**34,000**	**2,400**	**2,300**	**1,200**	**5,000**	--
2002 Off-Site Investigation								
HA-1	7/23/2002	14.0	**55**	<0.5	<0.5	<0.5	**1.2**	--
HA-2	7/23/2002	14.0	**83**	<0.5	**0.77**	**0.52**	**2.8**	--
HA-3	7/23/2002	15.0	<50	<0.5	<0.5	<0.5	<0.5	--
HA-4	7/23/2002	15.0	<50	<0.5	<0.5	<0.5	<0.5	--
2002 On-Site Investigation								
S-10 W	6/7/2002	17	**34,000**	**760**	**940**	**930**	**5,200**	--
S-11 W	6/7/2002	22	**78,000**	**2,000**	**7,000**	**2,600**	**14,000**	--
S-12 W	6/7/2002	18	**180,000**	**9,600**	**28,000**	**49,000**	**28,000**	--
S-13 W	6/7/2002	17.0	**22,000**	**2,400**	**850**	**900**	**1,900**	--
S-14 W	6/10/2002	17.0	**260,000**	**6,900**	**49,000**	**6,200**	**35,000**	--
S-15 W	6/10/2002	17.0	**130,000**	**15,000**	**15,000**	**4,100**	**20,000**	--
S-16 W	6/10/2002	17.0	**70,000**	**940**	**2,100**	**3,200**	**15,000**	--
S-17 W	6/10/2002	17.0	**69,000**	**2,600**	**1,000**	**1,900**	**13,000**	--
December 2000 Geoprobe Investigation								
GP-1-17	12/11/2000	17.0	**2,200**	**11**	**3.8**	**69**	**170**	**0.67**
GP-2-16	12/11/2000	16.0	<50	<0.50	<0.50	<0.50	<0.50	<0.50
GP-3-16	12/11/2000	16.0	**9,800**	**4,400**	**120**	**650**	**90**	<20
GP-4-16	12/11/2000	16.0	<50	<0.50	<0.50	<0.50	<0.50	<0.50
GP-5-16	12/11/2000	16.0	<50	<0.50	<0.50	<0.50	**0.80**	<0.50

Abbreviations and Notes:

ppm = parts per million (milligrams per kilogram).

TPHg = Total Petroleum Hydrocarbons as gasoline, analyzed by EPA Method 8260B.

Benzene, toluene, ethylbenzene, and xylene analyzed by EPA Method 8260B.

MTBE = Methyl tertiary butyl ether, analyzed by EPA Method 8260B.

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\[Cumulative 1230 14th Soil & GW Summary.xls]Table 2-Cumulative Water Data

Table 1 Cumulative Soil Analytical Results - Former Shell-branded Service Station, 1230 14th St., Oakland, California
Incident #97088250

Sample ID	Date	Depth (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	Oil and Grease	TPHd
			← (ppm) →							

Notes:

ppm = parts per million (milligrams per kilogram).

TPHg = Total Petroleum Hydrocarbons as gasoline, analyzed by EPA Method 8015 or 8260B.

TPHd = Total Petroleum Hydrocarbons as diesel, analyzed by EPA Method 8015.

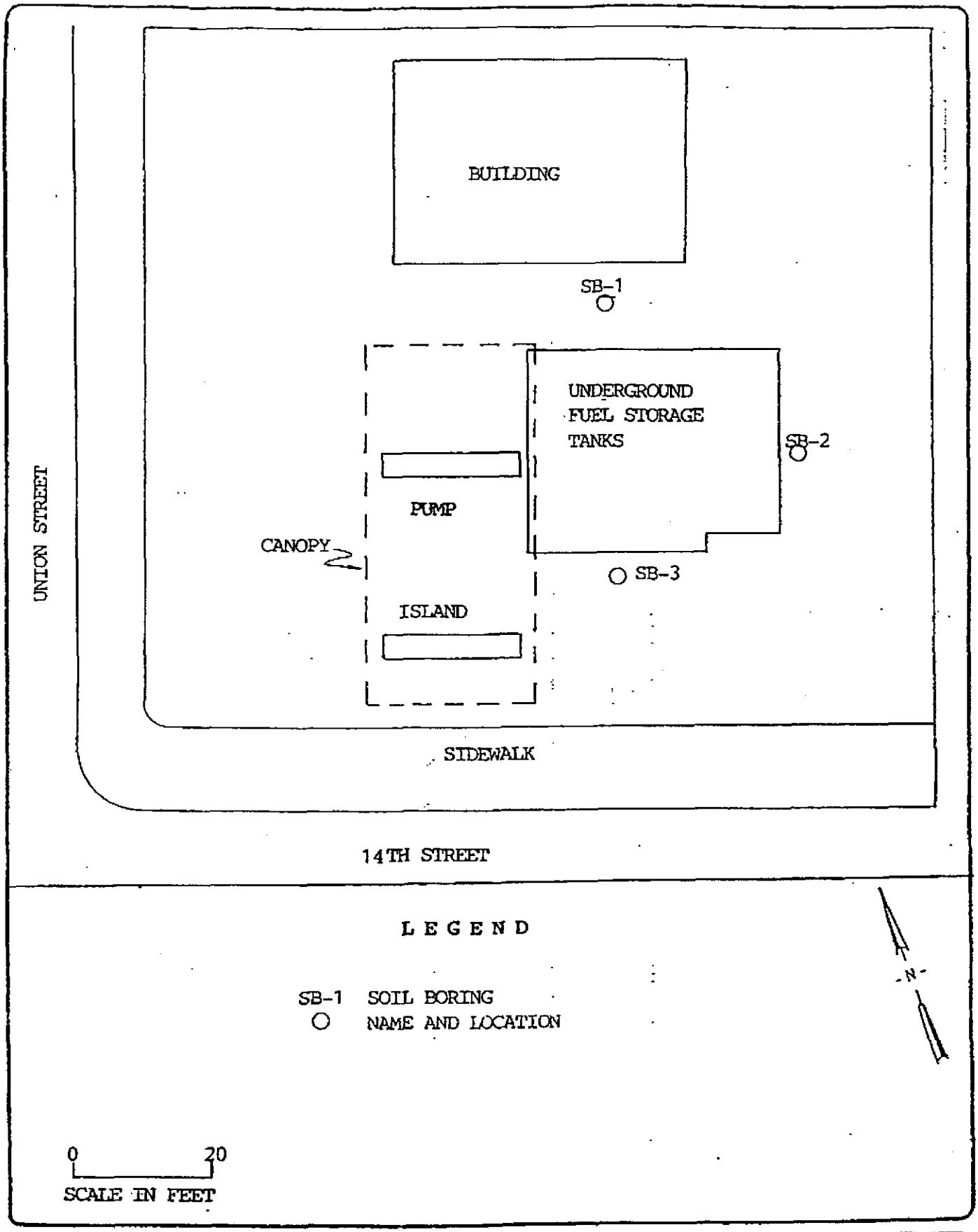
Benzene, toluene, ethylbenzene, and xylene analyzed by EPA Method 8020 or 8260B.

MTBE = Methyl tertiary butyl ether, analyzed by EPA Method 8020 or 8260B.

Petroleum oil and grease (POG) by Standard Method 5520.

-- = Not sampled
ppm=parts per million
<x=not detected above x ppm

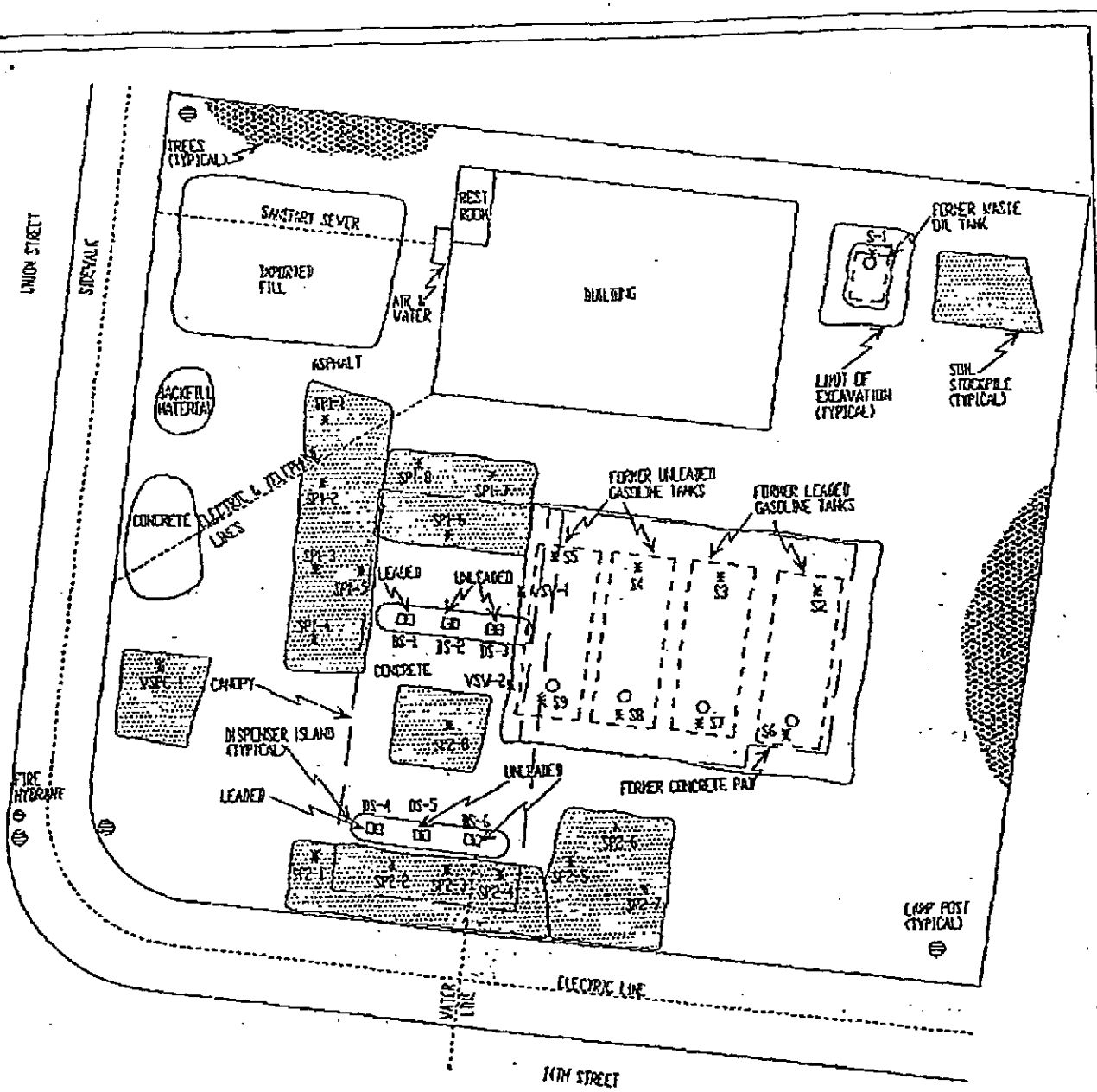
G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\[Cumulative 1230 14th Soil & GW Summary.xls]Table 1 -Cumul Soil TPHg&BTEX



TANK PROTECT ENGINEERING
Of Northern California

SITE PLAN
1230 14TH STREET
OAKLAND, CALIFORNIA

FIGURE



LEGEND

- ○ FILL HOLE
- S-1 NAME AND LOCATION
- × OF SOIL SAMPLE

-N-

0 20

SCALE IN FEET

TANK PROTECT ENGINEERING

SITE PLAN

1230 14TH STREET
OAKLAND, CA

DATE	9/1/93
FIGURE	
FILE #	150-1
DRAWN BY	JN
CHECKED BY	MK

ATTACHMENT D

Blaine's Groundwater Monitoring Report Summary Table

BLAINE
TECH SERVICES INC.

GROUNDWATER SAMPLING SPECIALISTS
SINCE 1985

February 3, 2005

Karen Petryna
Shell Oil Products US
20945 South Wilmington Avenue
Carson, CA 90810

First Quarter 2005 Groundwater Monitoring at
Former Shell Service Station
1230 14th Street
Oakland, CA

Monitoring performed on January 4, 2005

Groundwater Monitoring Report **050104-WC-1**

This report covers the routine monitoring of groundwater wells at this Former Shell facility. In accordance with standard procedures that conform to Regional Water Quality Control Board requirements, routine field data collection includes depth to water, total well depth, thickness of any separate immiscible layer, water column volume, calculated purge volume (if applicable), elapsed evacuation time (if applicable), total volume of water removed (if applicable), and standard water parameter instrument readings. Sample material is collected, contained, stored, and transported to the laboratory in conformance with EPA standards. Purgewater (if applicable) is, likewise, collected and transported to the Martinez Refining Company.

Basic field information is presented alongside analytical values excerpted from the laboratory report in the cumulative table of **WELL CONCENTRATIONS**. The full analytical report for the most recent samples and the field data sheets are attached to this report.

At a minimum, Blaine Tech Services, Inc. field personnel are certified on completion of a forty hour Hazardous Materials and Emergency Response training course per 29 CFR 1910.120. Field personnel are also enrolled in annual eight hour refresher courses.

Blaine Tech Services, Inc. conducts sampling and documentation assignments of this type as an independent third party. Our activities at this site consisted of objective data and sample collection only. No interpretation of analytical results, defining of hydrological conditions or formulation of recommendations was performed.

Please call if you have any questions.

Yours truly,

Leon Gearhart
Project Coordinator

LG/ks

attachments: Cumulative Table of WELL CONCENTRATIONS
Certified Analytical Report
Field Data Sheets

cc: Anni Kreml
Cambria Environmental Technology, Inc.
5900 Hollis Street, Suite A
Emeryville, CA 94608

WELL CONCENTRATIONS
Former Shell Service Station
1230 14th Street
Oakland, CA

Well ID	Date	TPPH (ug/L)	B (ug/L)	T (ug/L)	E (ug/L)	X (ug/L)	MTBE 8020 (ug/L)	MTBE 8260 (ug/L)	TOC (MSL)	Depth to Water (ft.)	GW Elevation (MSL)	DO Reading (ppm)
MW-1	03/25/1996	37,000	7,400	1,500	720	3,300	<500	NA	18.58	9.53	9.05	NA
MW-1	06/21/1996	35,000	9,900	460	340	3,500	890	NA	18.58	10.72	7.86	NA
MW-1	09/26/1996	19,000	8,200	510	780	790	<250	NA	18.58	12.88	5.70	NA
MW-1	12/19/1996	27,000	120	1,200	1,400	2,800	<100	NA	18.58	12.59	5.99	NA
MW-1	12/19/1996	32,000	12,000	1,300	1,600	3,100	830	NA	18.58	12.59	5.99	NA
MW-1	03/25/1997	39,000	13,000	1,600	840	3,100	730	NA	18.58	11.10	7.48	1.2
MW-1	06/26/1997	NA	NA	NA	NA	NA	NA	NA	18.58	12.42	6.16	NA
MW-1	09/26/1997	NA	NA	NA	NA	NA	NA	NA	18.58	13.31	5.27	0.8
MW-1	12/05/1997	NA	NA	NA	NA	NA	NA	NA	18.58	12.65	5.93	0.3
MW-1	02/19/1998	16,000	5,500	450	500	800	<500	NA	18.58	6.46	12.12	2.4
MW-1	06/08/1998	NA	NA	NA	NA	NA	NA	NA	18.58	6.62	11.96	1.2
MW-1	08/25/1998	NA	NA	NA	NA	NA	NA	NA	18.58	11.83	6.75	2.8
MW-1	12/28/1998	NA	NA	NA	NA	NA	NA	NA	18.58	12.01	6.57	2.6
MW-1	03/26/1999	NA	NA	NA	NA	NA	NA	NA	18.58	9.15	9.43	2.2
MW-1	06/30/1999	NA	NA	NA	NA	NA	NA	NA	18.58	11.22	7.36	3.8
MW-1	09/30/1999	NA	NA	NA	NA	NA	NA	NA	18.58	11.89	6.69	3.0
MW-1	12/27/1999	34,800	8,660	953	956	2,770	<1,000	NA	18.58	13.55	5.03	2.4/2.1
MW-1	01/21/2000	40,600	14,700	1,850	1,210	3,670	<500	NA	18.58	13.42	5.16	2.8
MW-1	03/07/2000	NA	NA	NA	NA	NA	NA	NA	18.58	8.11	10.47	0.4
MW-1	04/17/2000	NA	NA	NA	NA	NA	NA	NA	18.58	9.78	8.80	3.0/3.4
MW-1	04/18/2000	18,300	8,060	543	528	872	<50.0	NA	18.58	NA	NA	NA
MW-1	09/21/2000	NA	NA	NA	NA	NA	NA	NA	18.58	13.11	5.47	5.2
MW-1	10/17/2000	15,800	6,720	435	587	887	351	<66.7	18.58	12.61	5.97	1.2/0.8
MW-1	01/09/2001	NA	NA	NA	NA	NA	NA	NA	18.58	12.94	5.64	0.3
MW-1	04/27/2001	1,400	650	28	58	48	NA	<10	18.58	10.73	7.85	1.8/2.1
MW-1	07/03/2001	NA	NA	NA	NA	NA	NA	NA	18.58	12.00	6.58	1.8
MW-1	12/06/2001	4,500	1,500	85	160	210	NA	<50	18.58	10.53	8.05	2.5/2.9
MW-1	01/23/2002	NA	NA	NA	NA	NA	NA	NA	18.58	9.33	9.25	0.1
MW-1	04/17/2002	230	12	<0.50	4.6	2.5	NA	<5.0	18.58	10.49	8.09	6.3/5.3
MW-1	07/18/2002	NA	NA	NA	NA	NA	NA	NA	18.58	11.98	6.60	1.2

WELL CONCENTRATIONS
Former Shell Service Station
1230 14th Street
Oakland, CA

Well ID	Date	TPPH (ug/L)	B (ug/L)	T (ug/L)	E (ug/L)	X (ug/L)	MTBE 8020 (ug/L)	MTBE 8260 (ug/L)	TOC (MSL)	Depth to Water (ft.)	GW Elevation (MSL)	DO Reading (ppm)
MW-1	11/11/2002	12,000	2,600	240	470	640	NA	8.5	18.58	13.00	5.58	0.2/0.2
MW-1	01/16/2003	NA	NA	NA	NA	NA	NA	NA	18.58	9.68	8.90	4.4
MW-1	03/13/2003	820	340	2.7	<2.0	3.2	NA	<20	18.58	10.45	8.13	2.8/0.9
MW-1	04/23/2003	900	550	19	49	49	NA	<50	18.58	10.32	8.26	0.9/0.1
MW-1	05/13/2003	740	510	18	43	46	NA	<50	18.58	10.28	8.30	0.1/0.2
MW-1	06/13/2003	<5,000	1,500	82	180	250	NA	<500	18.58	11.16	7.42	0.3/0.8
MW-1	07/14/2003	5,300	3,400	160	340	420	NA	<20	18.58	11.66	6.92	0.6/0.3
MW-1	09/29/2003	10,000	5,700	400	670	1,000	NA	<50	18.58	12.44	6.14	0.6/0.7
MW-1	10/29/2003	19,000	6,600	560	820	1,300	NA	26	18.58	12.63	5.95	0.6/0.4
MW-1	01/05/2004	380	140	7.1	6.2	16	NA	<1.0	18.58	10.17	8.41	5.0/0.8
MW-1	04/01/2004	79	0.59	<0.50	<0.50	<1.0	NA	<0.50	18.58	9.57	9.01	4.6/1.2
MW-1	07/02/2004	4,100	2,100	33	110	81	NA	<10	18.58	11.81	6.77	0.6/0.5
MW-1	11/03/2004	8,000	3,800	150	480	460	NA	<25	18.58	12.53	6.05	1.45/2.1
MW-1	**01/04/2005**	**120**	**23**	**1.6**	**2.0**	**3.5**	**NA**	**<0.50**	**18.58**	**9.39**	**9.19**	**4.21/2.82**
MW-2	03/25/1996	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	17.90	8.19	9.71	NA
MW-2	06/21/1996	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	17.90	9.94	7.96	NA
MW-2	09/26/1996	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	17.90	12.15	5.75	NA
MW-2	12/19/1996	<50	<0.5	<0.5	<0.5	<0.5	<2.5	NA	17.90	11.70	6.20	NA
MW-2	03/25/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	17.90	9.25	8.65	1.8
MW-2	06/26/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	17.90	11.36	6.54	2.4
MW-2	09/26/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	17.90	12.56	5.34	1.1
MW-2	09/26/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	17.90	12.56	5.34	1.1
MW-2	12/05/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	17.90	11.15	6.75	0.7
MW-2	02/19/1998	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	17.90	5.61	12.29	2.7
MW-2	06/08/1998	<50	<0.30	<0.30	<0.30	<0.60	<10	NA	17.90	5.58	12.32	3.2
MW-2	08/25/1998	NA	NA	NA	NA	NA	NA	NA	17.90	10.67	7.23	1.7
MW-2	12/28/1998	<50.0	<0.500	<0.500	<0.500	<0.500	<2.00	NA	17.90	11.65	6.25	0.4/0.8
MW-2	03/26/1999	NA	NA	NA	NA	NA	NA	NA	17.90	8.60	9.30	0.7
MW-2	06/30/1999	<50.0	<0.500	<0.500	<0.500	<0.500	<5.00	NA	17.90	10.30	7.60	2.3

WELL CONCENTRATIONS
Former Shell Service Station
1230 14th Street
Oakland, CA

Well ID	Date	TPPH (ug/L)	B (ug/L)	T (ug/L)	E (ug/L)	X (ug/L)	MTBE 8020 (ug/L)	MTBE 8260 (ug/L)	TOC (MSL)	Depth to Water (ft.)	GW Elevation (MSL)	DO Reading (ppm)
MW-2	09/30/1999	NA	NA	NA	NA	NA	NA	NA	17.90	10.77	7.13	1.9
MW-2	12/27/1999	<50.0	<0.500	<0.500	<0.500	<0.500	<5.00	NA	17.90	12.21	5.69	0.7/0.7
MW-2	03/07/2000	NA	NA	NA	NA	NA	NA	NA	17.90	7.13	10.77	1.1
MW-2	04/17/2000	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50	NA	17.90	8.35	9.55	1.8/1.8
MW-2	09/21/2000	NA	NA	NA	NA	NA	NA	NA	17.90	11.76	6.14	2.1
MW-2	10/17/2000	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50	NA	17.90	11.80	6.10	0.9/0.6
MW-2	01/09/2001	NA	NA	NA	NA	NA	NA	NA	17.90	12.14	5.76	0.7
MW-2	04/27/2001	<50	<0.50	<0.50	<0.50	<0.50	NA	<0.50	17.90	9.85	8.05	1.1/0.9
MW-2	07/03/2001	NA	NA	NA	NA	NA	NA	NA	17.90	11.20	6.70	1.2
MW-2	12/06/2001	<50	<0.50	<0.50	<0.50	<0.50	NA	<5.0	17.90	10.77	7.13	3.9/2.1
MW-2	01/23/2002	NA	NA	NA	NA	NA	NA	NA	17.90	8.64	9.26	2.5
MW-2	04/17/2002	<50	<0.50	<0.50	<0.50	<0.50	NA	<5.0	17.90	9.61	8.29	3.5/5.2
MW-2	07/18/2002	NA	NA	NA	NA	NA	NA	NA	17.90	11.09	6.81	1.4
MW-2	11/11/2002	<50	<0.50	<0.50	<0.50	<0.50	NA	<5.0	17.90	12.16	5.74	0.2/0.3
MW-2	01/16/2003	NA	NA	NA	NA	NA	NA	NA	17.90	8.92	8.98	1.7
MW-2	03/13/2003	NA	NA	NA	NA	NA	NA	NA	17.90	9.60	8.30	1.1
MW-2	04/23/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<5.0	17.90	9.48	8.42	0.4/0.2
MW-2	05/13/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<5.0	17.90	9.45	8.45	0.5/0.3
MW-2	06/13/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<5.0	17.90	10.28	7.62	0.6/0.9
MW-2	07/14/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	17.90	10.67	7.23	0.5/.09
MW-2	09/29/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	17.90	11.58	6.32	1.9/1.3
MW-2	10/29/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	17.90	11.76	6.14	4.3/0.5
MW-2	01/05/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	17.90	9.36	8.54	1.2/0.8
MW-2	04/01/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	17.90	8.77	9.13	4.0/0.3
MW-2	07/02/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	17.90	11.04	6.86	0.4/0.3
MW-2	11/03/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	0.54	17.90	11.71	6.19	6.4/1.40
MW-2	**01/04/2005**	**<50**	**<0.50**	**<0.50**	**<0.50**	**<1.0**	**NA**	**0.62**	**17.90**	**8.68**	**9.22**	**4.41/2.88**
MW-3	03/25/1996	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.18	8.47	9.71	NA
MW-3	06/21/1996	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.18	10.40	7.78	NA

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MW-3	09/26/1996	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.18	12.45	5.73	NA
MW-3	12/19/1996	<50	<0.5	<0.5	<0.5	<0.5	<2.5	NA	18.18	12.14	6.02	NA
MW-3	03/25/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.18	9.54	8.64	2.2
MW-3	06/26/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.18	11.66	6.52	3.6
MW-3	09/26/1997	<50	<0.50	<050	<0.50	<0.50	<2.5	NA	18.18	12.85	5.33	1.1
MW-3	12/05/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.18	11.44	6.74	0.6
MW-3	02/19/1998	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.18	6.78	11.40	3.6
MW-3	06/08/1998	<50	<0.30	<0.30	<0.30	<0.60	<10	NA	18.18	6.82	11.36	3.8
MW-3	06/08/1998	<50	<0.30	<0.30	<0.30	<0.60	<10	NA	18.18	6.82	11.36	3.8
MW-3	08/25/1998	NA	NA	NA	NA	NA	NA	NA	18.18	11.09	7.09	1.2
MW-3	12/28/1998	<50.0	<0.500	<0.500	<0.500	<0.500	<2.00	NA	18.18	11.84	6.34	0.9/0.6
MW-3	03/26/1999	NA	NA	NA	NA	NA	NA	NA	18.18	8.57	9.61	0.8
MW-3	06/30/1999	<50.0	<0.500	<0.500	<0.500	<0.500	<5.00	NA	18.18	10.61	7.57	4.8
MW-3	09/30/1999	NA	NA	NA	NA	NA	NA	NA	18.18	11.53	6.65	1.4
MW-3	12/27/1999	<50.0	<0.500	<0.500	<0.500	<0.500	<5.00	NA	18.18	12.35	5.83	1.4/2.5
MW-3	03/07/2000	NA	NA	NA	NA	NA	NA	NA	18.17	7.36	10.81	5.8
MW-3	04/17/2000	<50.0	<0.500	<0.500	<0.500	<0.500	19.3	NA	18.17	8.39	9.78	6.5/5.1
MW-3	09/21/2000	NA	NA	NA	NA	NA	NA	NA	18.17	12.01	6.16	3.0
MW-3	10/17/2000	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50	NA	18.17	12.10	6.07	2.0/1.0
MW-3	01/09/2001	NA	NA	NA	NA	NA	NA	NA	18.17	12.43	5.74	1.9
MW-3	04/27/2001	<50	<0.50	<0.50	<0.50	<0.50	NA	<0.50	18.17	10.10	8.07	2.3/2.4
MW-3	07/03/2001	NA	NA	NA	NA	NA	NA	NA	18.17	11.45	6.72	1.4
MW-3	12/06/2001	<50	<0.50	<0.50	<0.50	<0.50	NA	<5.0	18.17	11.07	7.10	2.8/3.9
MW-3	01/23/2002	NA	NA	NA	NA	NA	NA	NA	18.17	8.89	9.28	3.1
MW-3	04/17/2002	<50	<0.50	<0.50	<0.50	<0.50	NA	<5.0	18.17	9.92	8.25	3.7/3.2
MW-3	07/18/2002	NA	NA	NA	NA	NA	NA	NA	18.17	11.42	6.75	1.6
MW-3	11/11/2002	<50	<0.50	<0.50	<0.50	<0.50	NA	<5.0	18.17	12.44	5.73	0.3/0.4
MW-3	01/16/2003	NA	NA	NA	NA	NA	NA	NA	18.17	9.25	8.92	2.1
MW-3	03/13/2003	NA	NA	NA	NA	NA	NA	NA	18.17	9.84	8.33	1.2
MW-3	04/23/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<5.0	18.17	9.71	8.46	0.7/0.2

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MW-3	05/13/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<5.0	18.17	9.70	8.47	0.6/0.2
MW-3	06/13/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<5.0	18.17	10.58	7.59	0.4/1.3
MW-3	07/14/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.17	10.98	7.19	0.4/.03
MW-3	09/29/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.17	11.84	6.33	1.4/1.1
MW-3	10/29/2003	58 b	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.17	12.05	6.12	0.8/0.4
MW-3	01/05/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.17	9.70	8.47	1.3/0.7
MW-3	04/01/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.17	9.03	9.14	1.2/0.6
MW-3	07/02/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.17	11.15	7.02	0.7/0.5
MW-3	11/03/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.17	11.98	6.19	1.65/2.75
MW-3	**01/04/2005**	**<50**	**<0.50**	**<0.50**	**<0.50**	**<1.0**	**NA**	**<0.50**	**18.17**	**8.98**	**9.19**	**3.21/1.87**
MW-4	03/25/1996	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.01	9.20	8.81	NA
MW-4	06/21/1996	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.01	10.25	7.76	NA
MW-4	09/26/1996	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.01	12.29	5.72	NA
MW-4	12/19/1996	<50	<0.5	<0.5	<0.5	<0.5	<2.5	NA	18.01	12.47	5.54	NA
MW-4	03/25/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.01	9.44	8.57	1.8
MW-4	06/26/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.01	11.57	6.44	6.2
MW-4 (D)	06/26/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.01	11.57	6.44	6.2
MW-4	09/26/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.01	12.75	5.26	2.1
MW-4	12/05/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.01	11.37	6.64	1.0
MW-4 (D)	12/05/1997	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.01	11.37	6.64	1.0
MW-4	02/19/1998	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA	18.01	5.59	12.42	6.5
MW-4	06/08/1998	<50	<0.30	<0.30	<0.30	<0.60	<10	NA	18.01	5.65	12.36	2.6
MW-4	08/25/1998	NA	NA	NA	NA	NA	NA	NA	18.01	10.98	7.03	2.4
MW-4	12/28/1998	<50.0	<0.500	<0.500	<0.500	<0.500	<2.00	NA	18.01	11.83	6.18	1.3/1.2
MW-4	03/26/1999	NA	NA	NA	NA	NA	NA	NA	18.01	8.40	9.61	1.9
MW-4	06/30/1999	<50.0	<0.500	<0.500	<0.500	<0.500	<5.00	NA	18.01	10.53	7.48	7.6
MW-4	09/30/1999	NA	NA	NA	NA	NA	NA	NA	18.01	11.03	6.98	2.6
MW-4	12/27/1999	<50.0	<0.500	<0.500	<0.500	<0.500	<5.00	NA	18.01	12.53	5.48	1.9/0.8
MW-4	03/07/2000	NA	NA	NA	NA	NA	NA	NA	18.01	7.00	11.01	6.5

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MW-4	04/17/2000	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50	NA	18.01	8.57	9.44	5.1/5.1
MW-4	09/21/2000	NA	NA	NA	NA	NA	NA	NA	18.01	12.05	5.96	3.0
MW-4	10/17/2000	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50	NA	18.01	11.96	6.05	5.5/1.2
MW-4	01/09/2001	NA	NA	NA	NA	NA	NA	NA	18.01	12.33	5.68	2.1
MW-4	04/27/2001	<50	<0.50	<0.50	<0.50	<0.50	NA	<0.50	18.01	9.96	8.05	5.3/3.8
MW-4	07/03/2001	NA	NA	NA	NA	NA	NA	NA	18.01	11.35	6.66	4.5
MW-4	12/06/2001	<50	<0.50	<0.50	<0.50	<0.50	NA	<5.0	18.01	10.99	7.02	10.23/6.5
MW-4	01/23/2002	NA	NA	NA	NA	NA	NA	NA	18.01	8.80	9.21	8.8
MW-4	04/17/2002	<50	<0.50	<0.50	<0.50	<0.50	NA	<5.0	18.01	9.75	8.26	7.0/5.1
MW-4	07/18/2002	NA	NA	NA	NA	NA	NA	NA	18.01	11.32	6.69	5.3
MW-4	11/11/2002	<50	<0.50	<0.50	<0.50	<0.50	NA	<5.0	18.01	12.36	5.65	3.6/2.0
MW-4	01/16/2003	NA	NA	NA	NA	NA	NA	NA	18.01	10.33	7.68	6.5
MW-4	03/13/2003	NA	NA	NA	NA	NA	NA	NA	18.01	10.06	7.95	6.5
MW-4	04/23/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<5.0	18.01	9.57	8.44	5.1/5.7
MW-4	05/13/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<5.0	18.01	9.55	8.46	2.0/2.5
MW-4	06/13/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<5.0	18.01	10.50	7.51	5.0/5.6
MW-4	07/14/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.01	10.86	7.15	3.9/4.2
MW-4	09/29/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.01	11.74	6.27	1.6/1.4
MW-4	10/29/2003	58 b	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.01	11.95	6.06	2.4/1.0
MW-4	01/05/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.01	10.35	7.66	7.4/7.5
MW-4	04/01/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.01	8.81	9.20	6.0/6.4
MW-4	07/02/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.01	11.10	6.91	0.8/0.6
MW-4	11/03/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.01	11.85	6.16	1.3/2.84
MW-4	**01/04/2005**	**<50**	**<0.50**	**<0.50**	**<0.50**	**<1.0**	**NA**	**<0.50**	**18.01**	**9.06**	**8.95**	**7.12/6.37**
MW-5	12/03/2001	NA	NA	NA	NA	NA	NA	NA	18.47	11.86	6.61	NA
MW-5	12/06/2001	31,000	3,000	2,000	1,100	3,000	NA	<50	18.47	11.40	7.07	3.1/3.2
MW-5	01/23/2002	NA	NA	NA	NA	NA	NA	NA	18.47	9.24	9.23	0.9
MW-5	04/17/2002	33,000	3,800	2,400	1,300	4,400	NA	<200	18.47	10.35	8.12	5.3/3.8
MW-5	07/18/2002	NA	NA	NA	NA	NA	NA	NA	18.47	11.82	6.65	0.8

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MW-5	11/11/2002	100,000	7,100	12,000	3,000	17,000	NA	5.1	18.47	12.86	5.61	1.2/1.4
MW-5	01/16/2003	NA	NA	NA	NA	NA	NA	NA	18.47	9.57	8.90	0.0
MW-5	03/13/2003	33,000	2,800	2,200	980	4,600	NA	<100	18.47	10.30	8.17	0.5/0.3
MW-5	04/07/2003	NA	NA	NA	NA	NA	NA	NA	18.47	10.29	8.18	NA
MW-5	04/23/2003	33,000	2,900	3,100	960	5,800	NA	<250	18.47	10.15	8.32	0.1/0.1
MW-5	05/13/2003	30,000	2,600	1,500	850	4,500	NA	<250	18.47	10.12	8.35	0.4/0.3
MW-5	06/13/2003	33,000	3,400	2,300	1,000	4,400	NA	<500	18.47	11.00	7.47	0.3/0.3
MW-5	07/14/2003	41,000	5,100	3,500	1,400	5,100	NA	<50	18.47	11.39	7.08	0.5/0.5
MW-5	09/29/2003	59,000	6,600	4,200	1,500	6,500	NA	<50	18.47	12.24	6.23	0.6/0.5
MW-5	10/29/2003	45,000	6,800	3,500	1,500	6,400	NA	21	18.47	12.45	6.02	0.5/0.3
MW-5	01/05/2004	26,000	4,900	1,700	1,100	3,300	NA	<50	18.47	9.97	8.50	0.9/1.2
MW-5	04/01/2004	29,000	5,300	2,700	880	2,900	NA	<50	18.47	9.43	9.04	0.3/1.0
MW-5	07/02/2004	19,000	5,300	740	1,100	1,400	NA	<50	18.47	11.62	6.85	0.4/0.5
MW-5	11/03/2004	31,000	7,500	2,300	1,400	4,400	NA	<50	18.47	12.26	6.21	2.5/1.9
MW-5	**01/04/2005**	**18,000**	**3,500**	**1,200**	**730**	**2,300**	**NA**	**<25**	**18.47**	**9.13**	**9.34**	**0.44/1.64**
MW-6	12/03/2001	NA	NA	NA	NA	NA	NA	NA	18.84	12.19	6.65	NA
MW-6	12/06/2001	76	5.7	3.8	1.4	7.0	NA	<5.0	18.84	11.70	7.14	6.3/6.1
MW-6	01/23/2002	NA	NA	NA	NA	NA	NA	NA	18.84	9.57	9.27	8.7
MW-6	04/17/2002	<50	<0.50	<0.50	<0.50	<0.50	NA	<5.0	18.84	10.73	8.11	9.8/9.1
MW-6	07/18/2002	NA	NA	NA	NA	NA	NA	NA	18.84	12.27	6.57	1.7
MW-6	11/11/2002	580	55	<0.50	<0.50	2.8	NA	<5.0	18.84	13.24	5.60	0.3/0.6
MW-6	01/16/2003	NA	NA	NA	NA	NA	NA	NA	18.84	9.89	8.95	6.4
MW-6	03/13/2003	NA	NA	NA	NA	NA	NA	NA	18.84	10.66	8.18	5.5
MW-6	04/23/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<5.0	18.84	10.57	8.27	3.7/4.4
MW-6	05/13/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<5.0	18.84	10.56	8.28	3.5/3.0
MW-6	06/13/2003	<50	<0.50	<0.50	<0.50	<1.0	NA	<5.0	18.84	11.48	7.36	2.7/3.1
MW-6	07/14/2003	230 b	3.4	<0.50	<0.50	<1.0	NA	<0.50	18.84	11.83	7.01	1.8/1.3
MW-6	09/29/2003	910 b	46	<2.5	<2.5	<5.0	NA	<2.5	18.84	12.70	6.14	1.1/1.0
MW-6	10/29/2003	830	38	0.53	<0.50	3.3	NA	0.60	18.84	12.91	5.93	1.2/0.9

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MW-6	01/05/2004	93	0.92	<0.50	<0.50	<1.0	NA	<0.50	18.84	10.35	8.49	6.2/4.3
MW-6	04/01/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.84	9.80	9.04	3.5/3.4
MW-6	07/02/2004	370	3.0	<0.50	<0.50	<1.0	NA	<0.50	18.84	12.09	6.75	0.6/1.0
MW-6	11/03/2004	540	22	0.73	<0.50	1.5	NA	0.82	18.84	12.84	6.00	2.28/0.84
MW-6	**01/04/2005**	**<50**	**<0.50**	**<0.50**	**<0.50**	**<1.0**	**NA**	**<0.50**	**18.84**	**9.55**	**9.29**	**6.71/5.16**
MW-7	12/03/2001	NA	NA	NA	NA	NA	NA	NA	19.20	12.66	6.54	NA
MW-7	12/06/2001	1,800	390	<2.0	6.2	<2.0	NA	<20	19.20	12.20	7.00	3.9/3.8
MW-7	01/23/2002	NA	NA	NA	NA	NA	NA	NA	19.20	10.00	9.20	9.4
MW-7	04/17/2002	<50	<0.50	<0.50	<0.50	<0.50	NA	<5.0	19.20	11.21	7.99	8.8/7.3
MW-7	07/18/2002	NA	NA	NA	NA	NA	NA	NA	19.20	12.69	6.51	0.8
MW-7	11/11/2002	3,000	190	<0.50	<0.50	4.3	NA	5.2	19.20	13.69	5.51	0.4/0.8
MW-7	01/16/2003	NA	NA	NA	NA	NA	NA	NA	19.20	10.36	8.84	7.9
MW-7	03/13/2003	NA	NA	NA	NA	NA	NA	NA	19.20	11.16	8.04	5.2
MW-7	04/23/2003	250	48	<0.50	<0.50	<1.0	NA	<5.0	19.20	11.02	8.18	3.2/1.3
MW-7	05/13/2003	1,700	550	<2.5	<2.5	<5.0	NA	<25	19.20	11.00	8.20	2.0/1.5
MW-7	06/13/2003	1,500 b	470	<2.5	<2.5	<5.0	NA	<25	19.20	11.90	7.30	1.8/1.6
MW-7	07/14/2003	1300 b	1,200	<10	<10	<20	NA	<10	19.20	12.29	6.91	0.4/0.2
MW-7	09/29/2003	5,200	1,200	<10	<10	<20	NA	<10	19.20	13.12	6.08	0.9/0.9
MW-7	10/29/2003	4,800	1,100	<5.0	<5.0	<10	NA	8.9	19.20	13.34	5.86	0.4/0.3
MW-7	01/05/2004	53	6.7	<0.50	<0.50	<1.0	NA	<0.50	19.20	10.85	8.35	1.4/2.3
MW-7	04/01/2004	<50	<0.50	<0.50	<0.50	<1.0	NA	<0.50	19.20	10.28	8.92	5.5/6.2
MW-7	07/02/2004	8,100 d	3,400	<25	<25	<50	NA	<25	19.20	12.48	6.72	0.8/0.8
MW-7	11/03/2004	3,700	1,200	<5.0	<5.0	<10	NA	<5.0	19.20	13.25	5.95	1.9/0.8
MW-7	**01/04/2005**	**<50**	**2.0**	**<0.50**	**<0.50**	**<1.0**	**NA**	**<0.50**	**19.20**	**10.02**	**9.18**	**6.31/5.71**
VW/MW-2	03/25/1996	13,000	900	920	180	1,500	<250	NA	18.30	9.04	9.26	NA
VW/MW-2	06/21/1996	27,000	4,100	1,100	1,400	3,200	700	NA	18.30	10.48	7.82	NA
VW/MW-2	09/26/1996	27,000	5,300	1,900	980	2,200	<500	NA	18.30	12.52	5.78	NA
VW/MW-2 (D)	09/26/1996	29,000	5,800	2,200	1,100	2,500	<250	NA	18.30	12.52	5.78	NA

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VW/MW-2	12/19/1996	50,000	6,200	5,100	1,700	5,600	590	NA	18.30	12.42	5.88	NA
VW/MW-2	03/25/1997	210	5.6	<0.50	0.52	<0.50	14	NA	18.30	9.83	8.47	2.0
VW/MW-2 (D)	03/25/1997	250	1.7	0.58	0.51	<0.50	4.7	NA	18.30	9.83	8.47	2.0
VW/MW-2	06/26/1997	NA	NA	NA	NA	NA	NA	NA	18.30	12.43	5.87	NA
VW/MW-2	09/26/1997	NA	NA	NA	NA	NA	NA	NA	18.30	12.98	5.32	0.9
VW/MW-2	12/05/1997	NA	NA	NA	NA	NA	NA	NA	18.30	12.20	6.10	0.4
VW/MW-2	02/19/1998	<50	1.5	<0.50	<0.50	0.71	<2.5	NA	18.30	5.83	12.47	3.6
VW/MW-2	06/08/1998	NA	NA	NA	NA	NA	NA	NA	18.30	5.80	12.50	1.0
VW/MW-2	08/25/1998	NA	NA	NA	NA	NA	NA	NA	18.30	11.72	6.58	4.8
VW/MW-2	12/28/1998	NA	NA	NA	NA	NA	NA	NA	18.30	11.69	6.61	2.7
VW/MW-2	03/26/1999	NA	NA	NA	NA	NA	NA	NA	18.30	8.75	9.55	2.8
VW/MW-2	06/30/1999	NA	NA	NA	NA	NA	NA	NA	18.30	10.72	7.58	4.7
VW/MW-2	09/30/1999	NA	NA	NA	NA	NA	NA	NA	18.30	12.24	6.06	4.9
VW/MW-2	12/27/1999	13,500	1,330	1,310	490	1,400	<250	NA	18.30	13.92	4.38	2.1/1.9
VW/MW-2	01/21/2000	12,100	2,200	1,080	429	1,120	<250	NA	18.30	13.26	5.04	2.8
VW/MW-2	03/07/2000	NA	NA	NA	NA	NA	NA	NA	18.28	7.87	10.41	3.7
VW/MW-2	04/17/2000	NA	NA	NA	NA	NA	NA	NA	18.28	9.65	8.63	3.7/4.1
VW/MW-2	04/18/2000	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50	NA	18.28	NA	NA	NA
VW/MW-2	09/21/2000	NA	NA	NA	NA	NA	NA	NA	18.28	12.75	5.53	6.2
VW/MW-2	10/17/2000	4,070	763	589	214	501	<50.0	NA	18.28	12.21	6.07	0.8/0.7
VW/MW-2	01/09/2001	NA	NA	NA	NA	NA	NA	NA	18.28	12.51	5.77	0.7
VW/MW-2	04/27/2001	80	5.7	<0.50	2.7	4.9	NA	<0.50	18.28	10.21	8.07	2.3/2.8
VW/MW-2	07/03/2001	NA	NA	NA	NA	NA	NA	NA	18.28	11.60	6.68	0.6
VW/MW-2	12/06/2001	160	1.7	1.0	1.8	4.6	NA	<5.0	18.28	11.15	7.13	3.7/2.3
VW/MW-2	01/23/2002	NA	NA	NA	NA	NA	NA	NA	18.28	9.07	9.21	0.5
VW/MW-2	04/17/2002	<50	2.1	<0.50	<0.50	<0.50	NA	<5.0	18.28	10.11	8.17	4.9/4.4
VW/MW-2	07/18/2002	NA	NA	NA	NA	NA	NA	NA	18.28	11.61	6.67	0.9
VW/MW-2	11/11/2002	15,000	1,300	1,300	680	1,800	NA	<5.0	18.28	12.63	5.65	0.2/0.2
VW/MW-2	01/16/2003	NA	NA	NA	NA	NA	NA	NA	18.28	9.35	8.93	0.4
VW/MW-2	03/13/2003	NA	NA	NA	NA	NA	NA	NA	18.28	10.09	8.19	0.8

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VW/MW-2	04/07/2003	NA	NA	NA	NA	NA	NA	NA	18.28	10.09	8.19	NA
VW/MW-2	04/23/2003	1,100	76	29	45	66	NA	<5.0	18.28	9.95	8.33	0.8/0.3
VW/MW-2	05/13/2003	1,200	38	16	16	24	NA	<5.0	18.28	9.90	8.38	0.2/0.2
VW/MW-2	06/13/2003	9,600	1,300	1,100	440	890	NA	<250	18.28	10.80	7.48	0.2/0.5
VW/MW-2	07/14/2003	11,000	1,300	1,800	430	1,500	NA	<5.0	18.28	11.20	7.08	0.5/0.5
VW/MW-2	09/29/2003	12,000	860	980	410	1,100	NA	<10	18.28	12.05	6.23	0.4/0.4
VW/MW-2	10/29/2003	12,000	1,100	940	530	1,200	NA	<10	18.28	12.29	5.99	0.7/0.3
VW/MW-2	01/05/2004	190 b	<0.50	<0.50	<0.50	<1.0	NA	<0.50	18.28	9.82	8.46	2.8/1.8
VW/MW-2	04/01/2004	410	1.4	0.54	1.6	1.0	NA	<0.50	18.28	9.24	9.04	1.7/0.1
VW/MW-2	07/02/2004	5,500	440	370	170	410	NA	<2.5	18.28	11.33	6.95	0.5/0.4
VW/MW-2	11/03/2004	3,800	260	210	150	600	NA	<2.5	18.28	12.14	6.14	0.9/1.4
VW/MW-2	**01/04/2005**	**280**	**5.8**	**20**	**7.8**	**26**	**NA**	**<0.50**	**18.28**	**9.03**	**9.25**	**1.66/2.66**
VW/MW-4	03/25/1996	83,000	6,500	7,000	2,000	11,000	<250	NA	18.14	8.45	9.69	NA
VW/MW-4 (D)	03/25/1996	84,000	6,400	7,000	2,100	12,000	<250	NA	18.14	8.45	9.69	NA
VW/MW-4	06/21/1996	110,000	14,000	15,000	3,700	17,000	1,700	NA	18.14	10.38	7.76	NA
VW/MW-4 (D)	06/21/1996	100,000	12,000	12,000	2,900	13,000	<1,000	NA	18.14	10.38	7.76	NA
VW/MW-4	09/26/1996	52,000	13,000	2,700	2,100	3,200	<500	NA	18.14	12.43	5.71	NA
VW/MW-4	12/19/1996	75,000	15,000	6,600	3,000	7,600	<1,250	NA	18.14	11.87	6.27	NA
VW/MW-4	03/25/1997	56,000	4,700	1,500	2,500	6,300	580	NA	18.14	9.60	8.54	2.4
VW/MW-4	06/26/1997	NA	NA	NA	NA	NA	NA	NA	18.14	12.36	5.78	NA
VW/MW-4	09/26/1997	NA	NA	NA	NA	NA	NA	NA	18.14	12.82	5.32	0.4
VW/MW-4	12/05/1997	NA	NA	NA	NA	NA	NA	NA	18.14	12.15	5.99	0.3
VW/MW-4	02/19/1998	4,100	320	40	44	520	<50	NA	18.14	5.85	12.29	1.8
VW/MW-4 (D)	02/19/98	4,300	340	44	47	540	<50	NA	18.14	5.85	12.29	1.8
VW/MW-4	06/08/1998	NA	NA	NA	NA	NA	NA	NA	18.14	5.87	12.27	1.8
VW/MW-4	08/25/1998	NA	NA	NA	NA	NA	NA	NA	18.14	10.96	7.18	2.5
VW/MW-4	12/28/1998	NA	NA	NA	NA	NA	NA	NA	18.14	11.28	6.86	0.9
VW/MW-4	03/26/1999	NA	NA	NA	NA	NA	NA	NA	18.14	8.45	9.69	1.9
VW/MW-4	06/30/1999	NA	NA	NA	NA	NA	NA	NA	18.14	9.70	8.44	3.6

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VW/MW-4	09/30/1999	NA	NA	NA	NA	NA	NA	NA	18.14	11.78	6.36	2.6
VW/MW-4	12/27/1999	33,900	3,740	2,000	1,130	5,090	587	NA	18.14	12.63	5.51	0.4/0.2
VW/MW-4	01/21/2000	13,900	1,560	568	227	1,990	<500	21.0a	18.14	13.07	5.07	1.0
VW/MW-4	03/07/2000	NA	NA	NA	NA	NA	NA	NA	18.13	7.82	10.31	0.9
VW/MW-4	04/17/2000	NA	NA	NA	NA	NA	NA	NA	18.13	9.18	8.95	1.4/1.9
VW/MW-4	04/18/2000	757	103	8.59	30.8	84.2	<25.0	NA	18.13	NA	NA	NA
VW/MW-4	09/21/2000	NA	NA	NA	NA	NA	NA	NA	18.13	12.18	5.95	5.0
VW/MW-4	10/17/2000	8,360	2,060	391	468	1,170	147	NA	18.13	12.03	6.10	0.7/0.8
VW/MW-4	01/09/2001	NA	NA	NA	NA	NA	NA	NA	18.13	12.42	5.71	0.9
VW/MW-4	04/27/2001	7,100	2,300	50	460	250	NA	<10	18.13	10.13	8.00	1.0/1.4
VW/MW-4	07/03/2001	NA	NA	NA	NA	NA	NA	NA	18.13	11.42	6.71	1.2
VW/MW-4	12/06/2001	7,700	750	90	300	350	NA	<25	18.13	11.02	7.11	2.5/1.9
VW/MW-4	01/23/2002	NA	NA	NA	NA	NA	NA	NA	18.13	8.89	9.24	0.4
VW/MW-4	04/17/2002	4,800	760	27	240	150	NA	<25	18.13	9.89	8.24	4.7/5.1
VW/MW-4	07/18/2002	NA	NA	NA	NA	NA	NA	NA	18.13	11.37	6.76	0.6
VW/MW-4	11/11/2002	14,000	2,800	480	700	1,300	NA	<100	18.13	12.41	5.72	0.3/0.3
VW/MW-4	01/16/2003	NA	NA	NA	NA	NA	NA	NA	18.13	9.17	8.96	0.8
VW/MW-4	03/13/2003	NA	NA	NA	NA	NA	NA	NA	18.13	9.85	8.28	1.1
VW/MW-4	04/23/2003	2,400	710	28	160	100	NA	<50	18.13	9.74	8.39	0.2/0.05
VW/MW-4	05/13/2003	3,300	720	35	170	160	NA	<50	18.13	9.70	8.43	0.2/0.2
VW/MW-4	06/13/2003	8,200	1,700	220	460	790	NA	<250	18.13	10.55	7.58	0.3/0.3
VW/MW-4	07/14/2003	3,700	900	190	220	540	NA	<10	18.13	10.90	7.23	0.5/0.4
VW/MW-4	09/29/2003	7,500	1,800	300	390	860	NA	<20	18.13	11.83	6.30	0.5/0.6
VW/MW-4	10/29/2003	10,000	2,600	400	510	1,200	NA	<13	18.13	12.03	6.10	0.5/0.4
VW/MW-4	01/05/2004	1,000	70	12	30	56	NA	<1.0	18.13	9.60	8.53	1.7/1.2
VW/MW-4	04/01/2004	1,000	64	7.0	22	18	NA	<1.0	18.13	9.00	9.13	0.6/0.1
VW/MW-4	07/02/2004	5,600	1,500	57	380	180	NA	<10	18.13	11.00	7.13	0.4/0.4
VW/MW-4	11/03/2004	9,400	2,400	210	560	890	NA	<10	18.13	11.85	6.28	1.5/2.1
VW/MW-4	**01/04/2005**	**110**	**12**	**<0.50**	**2.3**	**<1.0**	**NA**	**<0.50**	**18.13**	**8.89**	**9.24**	**2.40/1.05**

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VW/AS-1	03/25/1996	NA	NA	NA	NA	NA	NA	NA	18.60	8.98	9.62	NA
VW/AS-1	06/21/1996	NA	NA	NA	NA	NA	NA	NA	18.60	10.95	7.65	NA
VW/AS-1	09/26/1996	NA	NA	NA	NA	NA	NA	NA	18.60	12.98	5.62	NA
VW/AS-1	12/19/1996	NA	NA	NA	NA	NA	NA	NA	18.60	12.67	5.93	NA
VW/AS-1	03/25/1997	NA	NA	NA	NA	NA	NA	NA	18.60	10.12	8.48	NA
VW/AS-1	06/26/1997	NA	NA	NA	NA	NA	NA	NA	18.60	12.34	6.26	NA
VW/AS-1	09/26/1997	NA	NA	NA	NA	NA	NA	NA	18.60	13.40	5.20	NA
VW/AS-1	12/05/1997	NA	NA	NA	NA	NA	NA	NA	18.60	11.96	6.64	5.2
VW/AS-1	02/19/1998	NA	NA	NA	NA	NA	NA	NA	18.60	6.22	12.38	1.3
VW/AS-1	06/08/1998	NA	NA	NA	NA	NA	NA	NA	18.60	6.20	12.40	1.0
VW/AS-1	08/25/1998	NA	NA	NA	NA	NA	NA	NA	18.60	11.59	7.01	1.6
VW/AS-1	12/28/1998	NA	NA	NA	NA	NA	NA	NA	18.60	11.74	6.86	1.3
VW/AS-1	03/26/1999	NA	NA	NA	NA	NA	NA	NA	18.60	9.20	9.40	1.3
VW/AS-1	06/30/1999	NA	NA	NA	NA	NA	NA	NA	18.60	11.08	7.52	2.1
VW/AS-1	09/30/1999	NA	NA	NA	NA	NA	NA	NA	18.60	11.94	6.66	1.9
VW/AS-1	12/27/1999	8,940	2,000	95.7	1,200	570	606	NA	18.60	11.01	7.59	1.6/1.8
VW/AS-1	03/07/2000	NA	NA	NA	NA	NA	NA	NA	18.59	7.35	11.24	NA
VW/AS-1	04/17/2000	NA	NA	NA	NA	NA	NA	NA	18.59	9.08	9.51	1.9/2.0
VW/AS-1	04/18/2000	20,800	6,550	1,220	2,270	1,720	<250	NA	18.59	NA	NA	NA
VW/AS-1	09/21/2000	NA	NA	NA	NA	NA	NA	NA	18.59	11.98	6.61	2.1
VW/AS-1	10/17/2000	38,400	7,240	5,980	1,960	5,730	534	72.4	18.59	12.62	5.97	2.5/1.0
VW/AS-1	01/09/2001	NA	NA	NA	NA	NA	NA	NA	18.59	13.03	5.56	1.9
VW/AS-1	04/27/2001	34,000	8,000	2,100	2,500	2,000	NA	<25	18.59	10.71	7.88	2.9/2.1
VW/AS-1	07/03/2001	NA	NA	NA	NA	NA	NA	NA	18.59	12.03	6.56	2.0
VW/AS-1	12/06/2001	6,000	990	35	820	59	NA	<25	18.59	11.63	6.96	1.2/0.8
VW/AS-1	01/23/2002	NA	NA	NA	NA	NA	NA	NA	18.59	9.34	9.25	0.9
VW/AS-1	04/17/2002	12,000	2,900	57	1,400	98	NA	<200	18.59	10.41	8.18	3.3/2.9
VW/AS-1	07/18/2002	NA	NA	NA	NA	NA	NA	NA	18.59	12.13	6.46	0.3
VW/AS-1	11/11/2002	2,200	340	7.3	250	24	NA	<20	18.59	13.15	5.44	1.2/1.3
VW/AS-1	01/16/2003	NA	NA	NA	NA	NA	NA	NA	18.59	9.73	8.86	2.3

WELL CONCENTRATIONS
Former Shell Service Station
1230 14th Street
Oakland, CA

Well ID	Date	TPPH (ug/L)	B (ug/L)	T (ug/L)	E (ug/L)	X (ug/L)	MTBE 8020 (ug/L)	MTBE 8260 (ug/L)	TOC (MSL)	Depth to Water (ft.)	GW Elevation (MSL)	DO Reading (ppm)
VW/AS-1	03/13/2003	11,000	2,500	55	1,800	170	NA	<100	18.59	10.45	8.14	2.1/1.9
VW/AS-1	04/07/2003	NA	NA	NA	NA	NA	NA	NA	18.59	10.40	8.19	NA
VW/AS-1	04/23/2003	9,500	4,100	200	1,400	200	NA	<250	18.59	10.28	8.31	1.2/0.4
VW/AS-1	05/13/2003	9,700	2,300	110	1,100	140	NA	<250	18.59	10.26	8.33	0.5/2.0
VW/AS-1	06/13/2003	9,300	2,300	77	820	<100	NA	<500	18.59	11.15	7.44	1.0/0.5
VW/AS-1	07/15/2003	5,500	2,000	230	620	360	NA	20	18.59	11.62	6.97	1.8/1.9
VW/AS-1	09/29/2003	9,600	2,300	100	1,200	670	NA	<20	18.59	12.48	6.11	2.3/3.6
VW/AS-1	10/29/2003	10,000	2,000	39	1,000	370	NA	16	18.59	12.73	5.86	3.3/3.6
VW/AS-1	01/05/2004	2,000	710	18	410	18	NA	13	18.59	10.25	8.34	3.0/2.8
VW/AS-1	04/01/2004	27,000	9,100	1,200	2,200	1,400	NA	<50	18.52 c	9.60	8.92	1.0/1.4
VW/AS-1	07/02/2004	18,000	6,500	170	1,200	1,200	NA	<50	18.52	11.80	6.72	3.2/0.8
VW/AS-1	11/03/2004	4,500	1,700	23	280	55	NA	9.8	18.52	12.56	5.96	1.7/1.9
VW/AS-1	**01/04/2005**	**7,500**	**2,500**	**74**	**540**	**110**	**NA**	**<13**	**18.52**	**9.50**	**9.02**	**1.19/0.53**
VW/AS-3	03/25/1996	NA	NA	NA	NA	NA	NA	NA	18.17	8.50	9.67	NA
VW/AS-3	06/21/1996	NA	NA	NA	NA	NA	NA	NA	18.17	10.42	7.75	NA
VW/AS-3	09/26/1996	NA	NA	NA	NA	NA	NA	NA	18.17	12.49	5.68	NA
VW/AS-3	12/19/1996	NA	NA	NA	NA	NA	NA	NA	18.17	12.28	5.89	NA
VW/AS-3	03/25/1997	NA	NA	NA	NA	NA	NA	NA	18.17	9.61	8.56	NA
VW/AS-3	06/26/1997	NA	NA	NA	NA	NA	NA	NA	18.17	11.80	6.37	NA
VW/AS-3	09/26/1997	NA	NA	NA	NA	NA	NA	NA	18.17	12.89	5.28	NA
VW/AS-3	12/05/1997	NA	NA	NA	NA	NA	NA	NA	18.17	11.38	6.79	1.8
VW/AS-3	02/19/1998	NA	NA	NA	NA	NA	NA	NA	18.17	6.24	11.93	1.3
VW/AS-3	06/08/1998	NA	NA	NA	NA	NA	NA	NA	18.17	6.25	11.92	1.2
VW/AS-3	08/25/1998	NA	NA	NA	NA	NA	NA	NA	18.17	11.43	6.74	1.3
VW/AS-3	12/28/1998	NA	NA	NA	NA	NA	NA	NA	18.17	11.63	6.54	1.7
VW/AS-3	03/26/1999	NA	NA	NA	NA	NA	NA	NA	18.17	8.92	9.25	1.5
VW/AS-3	06/30/1999	NA	NA	NA	NA	NA	NA	NA	18.17	10.71	7.46	2.5
VW/AS-3	09/30/1999	NA	NA	NA	NA	NA	NA	NA	18.17	11.78	6.39	1.5

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VW/AS-3	12/27/1999	488	47.9	2.60	16.9	8.50	35.4	NA	18.17	12.57	5.60	1.5/2.1
VW/AS-3	03/07/2000	NA	NA	NA	NA	NA	NA	NA	18.14	4.82	13.32	NA
VW/AS-3	04/17/2000	NA	NA	NA	NA	NA	NA	NA	18.14	8.69	9.45	2.0/2.4
VW/AS-3	04/18/2000	3,110	871	<5.00	141	56.8	78.2	NA	18.14	NA	NA	NA
VW/AS-3	09/21/2000	NA	NA	NA	NA	NA	NA	NA	18.14	11.65	6.49	2.5
VW/AS-3	10/17/2000	7,730	2,700	<50.0	542	344	<250	42.1	18.14	12.13	6.01	1.6/1.0
VW/AS-3	01/09/2001	NA	NA	NA	NA	NA	NA	NA	18.14	12.51	5.63	2.2
VW/AS-3	04/27/2001	14,000	3,900	62	690	560	NA	46	18.14	10.20	7.94	2.8/1.6
VW/AS-3	07/03/2001	NA	NA	NA	NA	NA	NA	NA	18.14	11.55	6.59	2.6
VW/AS-3	12/06/2001	5,000	1,200	19	380	320	NA	<50	18.14	11.10	7.04	0.9/1.1
VW/AS-3	01/23/2002	NA	NA	NA	NA	NA	NA	NA	18.14	8.93	9.21	1.1
VW/AS-3	04/17/2002	17,000	5,000	<25	1,100	390	NA	<250	18.14	10.00	8.14	3.2/3.2
VW/AS-3	07/18/2002	NA	NA	NA	NA	NA	NA	NA	18.14	11.49	6.65	0.4
VW/AS-3	11/11/2002	1,700	290	1.5	150	2.8	NA	<10	18.14	12.43	5.71	1.0/1.1
VW/AS-3	01/16/2003	NA	NA	NA	NA	NA	NA	NA	18.14	9.32	8.82	4.7
VW/AS-3	03/13/2003	NA	NA	NA	NA	NA	NA	NA	18.14	9.88	8.26	2.7
VW/AS-3	04/23/2003	150	47	0.67	8.5	3.2	NA	<5.0	18.14	9.85	8.29	2.1/0.7
VW/AS-3	05/13/2003	440	35	<0.50	1.7	<1.0	NA	<5.0	18.14	9.81	8.33	1.4/1.8
VW/AS-3	06/13/2003	580	71	<2.5	40	<5.0	NA	<25	18.14	10.77	7.37	1.1/0.6
VW/AS-3	07/14/2003	1,100	120	4.9	63	9.3	NA	16	18.14	11.12	7.02	2.0/2.2
VW/AS-3	09/29/2003	160	54	2.2	6.9	8.7	NA	1.1	18.14	12.02	6.12	4.1/1.6
VW/AS-3	10/29/2003	350	16	<0.50	1.1	<1.0	NA	6.3	18.14	12.25	5.89	3.2/1.6
VW/AS-3	01/05/2004	2,700	870	39	130	250	NA	5.5	18.14	9.74	8.40	3.6/2.8
VW/AS-3	04/01/2004	1,300	240	4.1	36	45	NA	12	18.14	9.06	9.08	1.1/1.0
VW/AS-3	07/02/2004	610	59	<1.0	3.6	<2.0	NA	10	18.14	11.29	6.85	2.0/2.2
VW/AS-3	11/03/2004	200	<0.50	<0.50	<0.50	<1.0	NA	10	18.14	12.02	6.12	2.1/2.3
VW/AS-3	**01/04/2005**	**2,500**	**730**	**42**	**36**	**190**	**NA**	**<10**	**18.14**	**8.99**	**9.15**	**1.72/1.36**

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Well ID	Date	TPPH (ug/L)	B (ug/L)	T (ug/L)	E (ug/L)	X (ug/L)	MTBE 8020 (ug/L)	MTBE 8260 (ug/L)	TOC (MSL)	Depth to Water (ft.)	GW Elevation (MSL)	DO Reading (ppm)

Abbreviations:
TPPH = Total petroleum hydrocarbons as gasoline by EPA Method 8260B; prior to April 27, 2001, analyzed by EPA Method 8015.
BTEX = benzene, toluene, ethylbenzene, xylenes by EPA Method 8260B; prior to April 27, 2001, analyzed by EPA Method 8020.
MTBE = Methyl tertiary butyl ether
TOC = Top of Casing Elevation
GW = Groundwater
DO = Dissolved Oxygen
NA = Not applicable
ug/L = Parts per billion
ppm = Parts per million
MSL = Mean sea level
ft. = Feet
<n = Below detection limit
(D) = Duplicate sample
n/n = Pre-purge/Post-purge DO Readings

Notes:
a = Sample was analyzed outside of the EPA recommended holding time.
b = Hydrocarbon reported does not match the pattern of the laboratory's standard.
c = Top of casing change due to maintenance.
d = Sample contains discrete peak in addition to gasoline.
Site surveyed November 1, 2001 by Virgil Chavez Land Surveying of Vallejo, CA.

ATTACHMENT E

Geologic Map and Map Database of the Oakland Metropolitan Area, Alameda, Contra Costa, and San Francisco Counties, California, USGS, R.W. Graymer, 2000

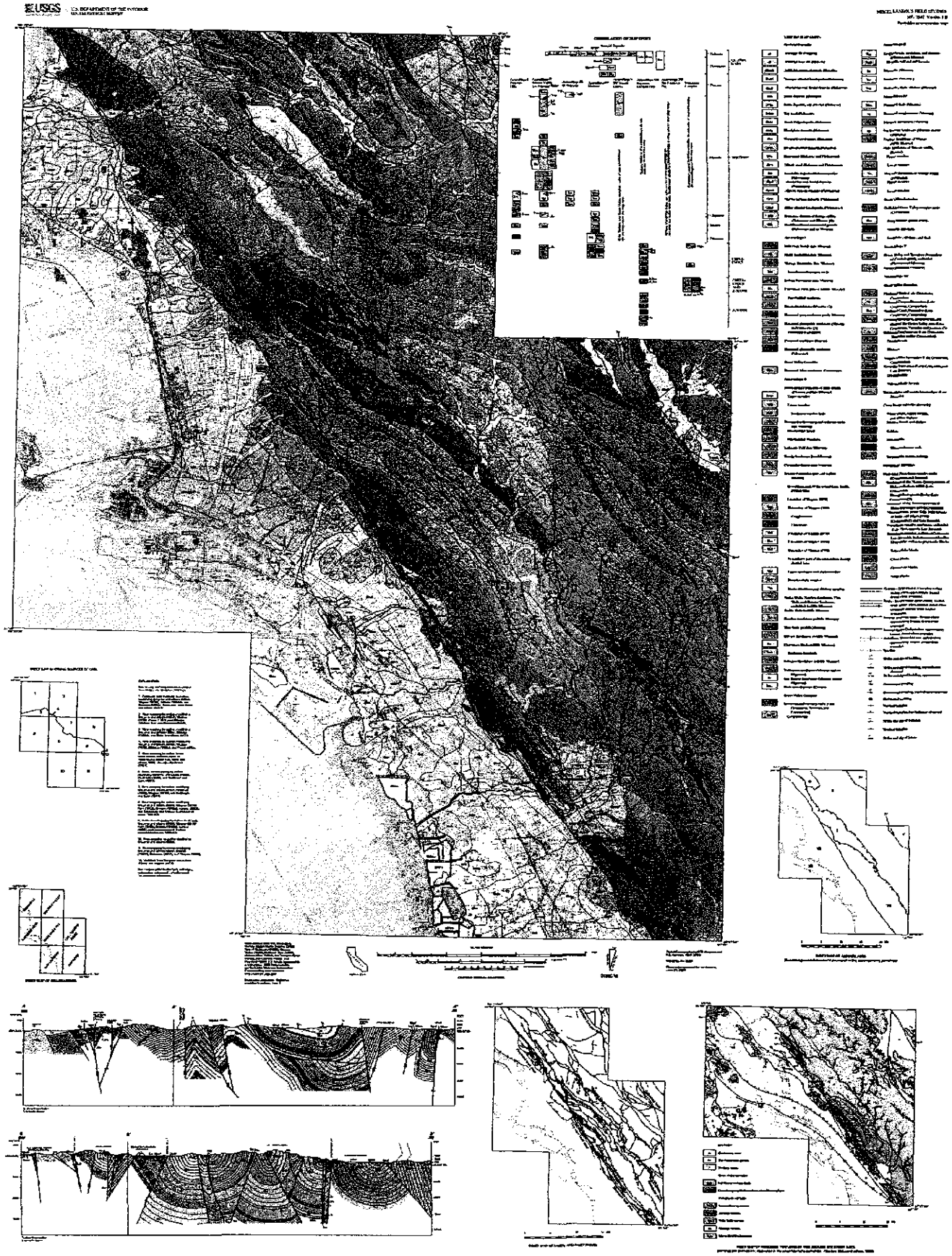
USGS
science for a changing world

Geologic map and map database of the Oakland metropolitan area, Alameda, Contra Costa, and San Francisco Counties, California

By R.W. Graymer

Pamphlet to accompany
MISCELLANEOUS FIELD STUDIES MF-2342
Version 1.0

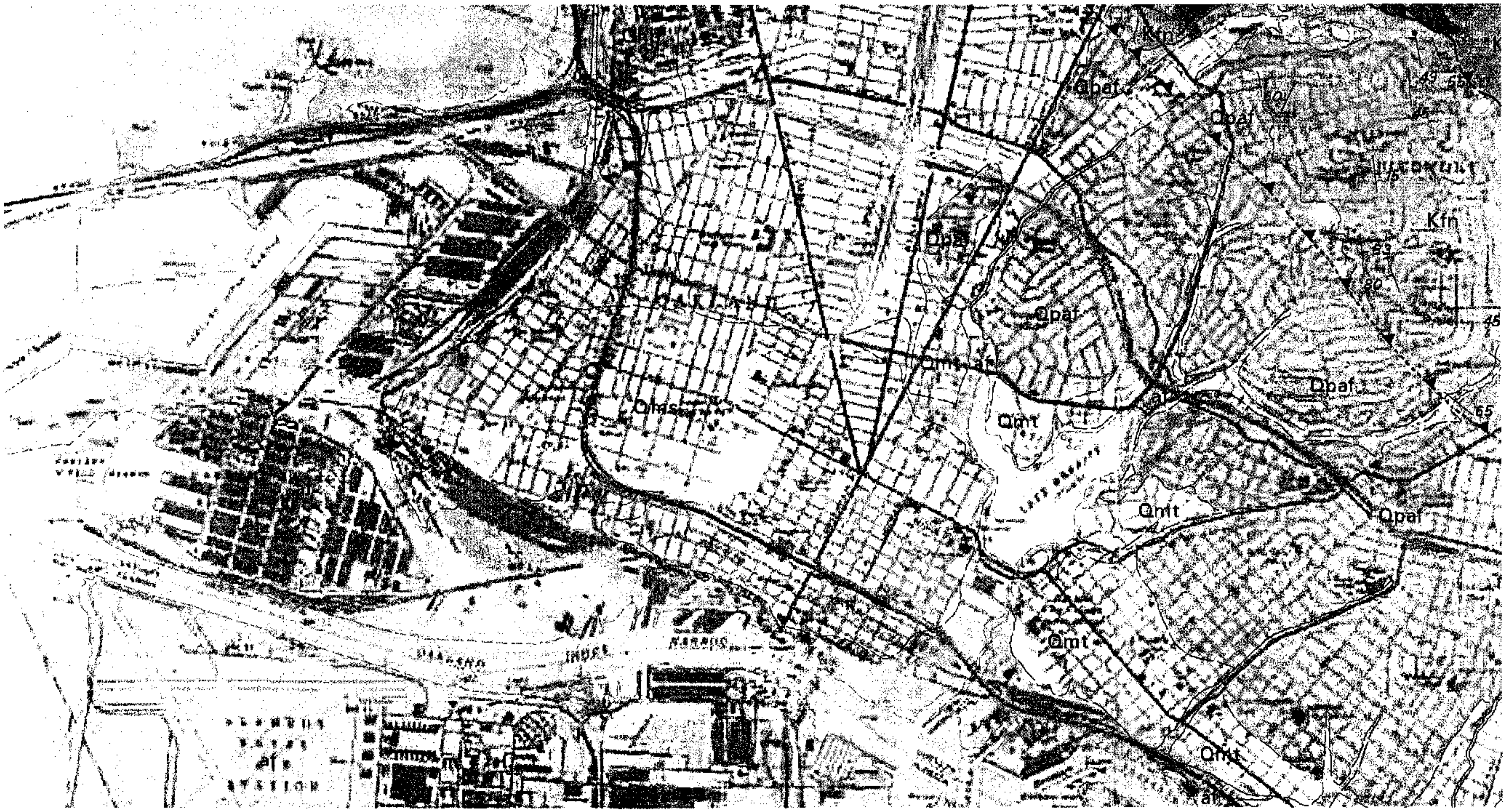
2000
U.S. Department of the Interior
U.S. Geological Survey



GEOLOGIC MAP AND MAP DATABASE OF THE OAKLAND METROPOLITAN AREA, ALAMEDA, CONTRA COSTA, AND SAN FRANCISCO COUNTIES, CALIFORNIA

By

R.W. Graymer


Kfn
Qpaf
Qmt

Description of Map Units

Surficial Deposits

af **Artificial fill (Historic)**—Man-made deposit of various materials and ages. Some are compacted and quite firm, but fills made before 1965 are nearly everywhere not compacted and consist simply of dumped materials

alf **Artificial levee fill (Historic)**—Man-made deposit of various materials and ages, forming artificial levees as much as 20 feet (6.5 meters) high. Some are compacted and quite firm, but fills made before 1965 are almost everywhere not compacted and consist simply of dumped materials. The distribution of levee fill conforms to levees shown on the most recent U.S. Geological Survey 7.5 minute quadrangles

Qhasc **Artificial stream channels (Historic)**--Modified stream channels, usually where streams have been straightened and realigned, but also including those channels that are confined within artificial dikes and levees

Qhaf1 **Younger alluvial fan deposits (Holocene)**--Brown, poorly-sorted, dense, sandy or gravelly clay. Small fans at mountain fronts have a probable debris flow origin. Larger Qhaf1 fans away from mountain fronts may represent the modern loci of deposition for Qhaf

Qhaf **Alluvial fan and fluvial deposits (Holocene)**--Alluvial fan deposits are brown or tan, medium dense to dense, gravely sand or sandy gravel that generally grades upward to sandy or silty clay. Near the distal fan edges, the fluvial deposits are typically brown, never reddish, medium dense sand that fines upward to sandy or silty clay. The best developed Holocene alluvial fans are on the San Francisco Bay plain. All other alluvial fans and fluvial deposits are confined to narrow valley floors

Qhb **Basin deposits (Holocene)**--Very fine silty clay to clay deposits occupying flat-floored basins at the distal edge of alluvial fans adjacent to the bay mud (Qhbm)

Qhbs **Basin deposits, salt-affected (Holocene)**--Clay to very fine silty-clay deposits similar to the Qhb deposits except that they contain carbonate nodules and iron-stained mottles (U.S. Soil Conservation Service, 1958). These deposits may have been formed by the interaction of bicarbonate-rich upland water and saline water of the San Francisco Bay estuary. With minor exceptions, salt-affected basin deposits are in contact with bay mud deposits, Qhbm

Qhbm **Bay mud (Holocene)**--Water saturated estuarine mud, predominantly gray, green, and blue clay and silty clay underlying marshlands and tidal mud flats of San Francisco Bay. The upper surface is covered with cordgrass (*Spartina sp.*) and pickleweed (*Salicornia sp.*). The mud also contains a few lenses of well-sorted, fine sand and silt, a few shelly layers (oysters), and peat. The mud interfingers with and grades into fine-grained deposits at the distal edge of Holocene fans and was deposited during the post-Wisconsin rise in sea-level, about 12 ka to present (Imbrie and others, 1984). Estimated thickness: 0-40 m. In places it rests unconformably on bedrock

Qhbr **Beach ridge deposits (Holocene)**--Long narrow ridge of probably well-sorted sand inferred from 1939 imagery. Observed between Emeryville and Berkeley, these deposits are now beneath the Interstate 80 roadbed

Qhfp **Floodplain deposits (Holocene)**--Medium to dark gray, dense, sandy to silty clay. Lenses of coarser material (silt, sand, and pebbles) may be locally present. Floodplain deposits usually occur between levee deposits (Qhl) and basin deposits (Qhb)

Qhl **Natural levee deposits (Holocene)**--Loose, moderately-sorted to well-sorted sandy or clayey silt grading to sandy or silty clay. These deposits are porous and permeable and provide conduits for transport of ground water. Levee deposits border stream channels, usually both banks, and slope away to flatter floodplains and basins. Levee deposits are best developed along San Pablo and Wildcat Creeks on the bay plain in Richmond. Abandoned levee systems have also been mapped

Qhsc **Stream channel deposits (Holocene)**—Poorly-sorted to well-sorted sand, silt, silty sand, or sandy gravel with minor cobbles. Cobbles are more common in the mountainous valleys. Many stream channels are presently lined with concrete or riprap. Engineering works such as diversion dams, drop structures, energy dissipaters, and percolation ponds also modify the original channel. Many stream channels have been straightened, and these are labeled Qhasc. This straightening is especially prevalent in the lower reaches of streams entering the estuary. The mapped distribution of stream channel deposits is controlled by the depiction of major creeks on the most recent U.S. Geological Survey 7.5 minute quadrangles. Only those deposits related to major creeks are mapped. In some places these deposits are

under shallow water for some or all of the year, as a result of reservoir release and annual variation in rainfall

Qds **Dune sand (Holocene and Pleistocene)**--Fine-grained, very well sorted, well-drained, eolian deposits. They occur mainly in large sheets, as well as many small hills, most displaying Barchan morphology. Dunes display as much as 30 m of erosional relief and are presently being buried by basin deposits (Qhb) and bay mud (Qhbm). They probably began accumulating after the last interglacial high stand of sea level began to recede about 71 ka, continued to form when sea level dropped to its Wisconsin minimum about 18 ka, and probably ceased to accumulate after sea level reached its present elevation (about 6 ka). Atwater (1982) recognized buried paleosols in the dunes, indicating periods of nondeposition

Qms **Merritt sand (Holocene and Pleistocene)**--Fine-grained, very well sorted, well-drained eolian deposits of western Alameda County. The Merritt sand outcrops in three large areas in Oakland and Alameda. Previously thought to be only of Pleistocene age, the Merrit sand is probably time-correlative with unit Qds, based on similar interfingering with Holocene bay mud (Qhbm) and presumably similar depositional environments associated with long-term sea-level fluctuations. The Merrit sand displays different morphology from unit Qds, however, forming large sheets up to 15 meters high with yardang morphology

Qls **Landslide deposits (Holocene and/or Pleistocene)**--Poorly sorted clay, silt, sand, and gravel. Only a few very large landslides have been mapped. For a more complete map of landslide deposits, see Nilsen and others (1979)

Qpaf **Alluvial fan and fluvial deposits (Pleistocene)**—Brown, dense, gravely and clayey sand or clayey gravel that fines upward to sandy clay. These deposits display various sorting and are located along most stream channels in the county. All Qpaf deposits can be related to modern stream courses. They are distinguished from younger alluvial fans and fluvial deposits by higher topographic position, greater degree of dissection, and stronger soil profile development. They are less permeable than Holocene deposits and locally contain fresh water mollusks and extinct late Pleistocene vertebrate fossils. They are overlain by Holocene deposits on lower parts of the alluvial plain and incised by channels that are partly filled with Holocene alluvium on higher parts of the alluvial plain. Maximum thickness is unknown but at least 50 m

Qpaf1 **Alluvial terrace deposits (Pleistocene)**--Deposits consist of crudely bedded, clast-supported gravels, cobbles, and boulders with a sandy matrix. Clasts as much as 35 cm intermediate diameter are present. Coarse sand lenses may be locally present. Pleistocene terrace deposits are cut into Qpaf alluvial fan deposits a few meters and lie up to several meters above Holocene deposits

Qmt **Marine terrace deposits (Pleistocene)**--Three small outcrops of marine terraces are located about 5 m above present mean sea level. Similar terraces are located north of the map area on the south shore of San Pablo Bay in the extreme northwest Contra Costa County at Lone Tree Point, Wilson Point, and an unnamed outcrop in between (Helley and Graymer, 1997b). The oyster beds at the base of those outcrops unconformably overlie the Cierbo Sandstone of Miocene Age and are in turn overlain by about 5 m of greenish-gray silty mudstone. The oysters have been dated by the Uranium-Thorium method (Helley and others, 1993) and are of last interglacial age, approximately 125 ka

Qpoaf **Older alluvial fan deposits (Pleistocene)**--Brown dense gravely and clayey sand or clayey gravel that fines upward to sandy clay. These deposits display various sorting qualities. All Qpoaf deposits can be related to modern stream courses. They are distinguished from younger alluvial fans and fluvial deposits by higher topographic position, greater degree of dissection, and stronger profile development. They are less permeable than younger deposits, and locally contain freshwater mollusks and extinct Pleistocene vertebrate fossils

QTi **Irvington Gravels of Savage (1951) (Pleistocene and Pliocene?)**--Poorly to well consolidated, distinctly bedded pebbles and cobbles, gray pebbly sand, and gray, coarse-grained, cross-bedded sand. Cobbles and pebbles are well- to sub-rounded, and as much as 25 cm in diameter, and consist of about 60 percent micaceous sandstone, 35 percent metamorphic and volcanic rocks and chert probably derived from the Franciscan complex, and 5 percent black laminated chert and cherty shale derived from the Claremont Formation. In the map area, these gravels are limited to several very small outcrops in the San Leandro quadrangle, thought to be offset from the main exposures of this unit in Fremont, south of the map area, by movement on the Hayward fault zone (Graymer, 1999). A large suite of early Pleistocene vertebrate fossils from this unit in quarries in Fremont was described by Savage (1951)

ATTACHMENT F

ProUCL Statistics Calculations for Representative Subsurface Soil and Groundwater Data

EPA/600/R04/079
April 2004

ProUCL Version 3.0 User Guide

by

Anita Singh
Lockheed Martin Environmental Services
1050 E. Flamingo Road, Suite E120, Las Vegas, NV 89119

Ashok K. Singh
Department of Mathematical Sciences
University of Nevada, Las Vegas, NV 89154

Robert W. Maichle
Lockheed Martin Environmental Services
1050 E. Flamingo Road, Suite E120, Las Vegas, NV 89119

U.S. Environmental Protection Agency

National Exposure Research Laboratory
Environmental Sciences

Technical Support Center for Monitoring and Site Characterization

Software for Calculating Upper Confidence Limits (UCLs)

Key to all Superfund risk assessments is the calculation of the exposure point concentration (EPC) and EPA recommends using the average concentration to represent "a reasonable estimate of the concentration likely to be contacted over time." EPA guidance goes on to say that "because of the uncertainty associated with estimating the true average concentration at a site, the 95 percent upper confidence limit (UCL) of the arithmetic mean should be used for this variable."

The Las Vegas TSC has developed the software to support the calculation of UCLs and recently OSWER incorporated **ProUCL** into their guidance document "Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites," OSWER 9285.6-10, December 2002.

ProUCL Version 3.00.02

Subsurface Soil Statistics

General Statistics

Data File	G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\Cumulative 1230 14th Soil & GW Summary.xls	Variable:	TPHg (ppm)

Raw Statistics	
Number of Valid Samples	55
Number of Unique Samples	10
Minimum	0
Maximum	1800
Mean	49.72182
Median	1
Standard Deviation	257.5248
Variance	66319.03
Coefficient of Variation	5.179312
Skewness	6.308553

Gamma Statistics Not Available

Lognormal Statistics Not Available

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.479703
Lilliefors 5% Critical Value	0.119468
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	107.8357

95% Non-parametric UCLs	
CLT UCL	106.8388
Adj-CLT UCL (Adjusted for skewness)	138.4009
Mod-t UCL (Adjusted for skewness)	112.7588
Jackknife UCL	107.8357
Standard Bootstrap UCL	105.0619
Bootstrap-t UCL	860.9104
Hall's Bootstrap UCL	793.9466
Percentile Bootstrap UCL	114.3491
BCA Bootstrap UCL	166.8164
95% Chebyshev (Mean, Sd) UCL	**201.083**
97.5% Chebyshev (Mean, Sd) UCL	266.5771
99% Chebyshev (Mean, Sd) UCL	395.2276

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\ProUCL files\[UCL stats for TPHg ppm soil.xls]General Statistics

General Statistics

Data File	G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\Cumulative 1230 14th Soil & GW Summary.xls	Variable:	Benzene (ppm)

Raw Statistics	
Number of Valid Samples	55
Number of Unique Samples	9
Minimum	0.0025
Maximum	4
Mean	0.107031
Median	0.005
Standard Deviation	0.554164
Variance	0.307097
Coefficient of Variation	5.177603
Skewness	6.735614

Gamma Statistics	
k hat	0.256044
k star (bias corrected)	0.254199
Theta hat	0.418018
Theta star	0.421052
nu hat	28.16479
nu star	27.96186
Approx.Chi Square Value (.05)	16.89645
Adjusted Level of Significance	0.045636
Adjusted Chi Square Value	16.66425

Log-transformed Statistics	
Minimum of log data	-5.99146
Maximum of log data	1.386294
Mean of log data	-4.99806
Standard Deviation of log data	1.427666
Variance of log data	2.038229

RECOMMENDATION
Data are Non-parametric (0.05)
Use 97.5% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.47684
Lilliefors 5% Critical Value	0.119468
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.232085

Gamma Distribution Test	
A-D Test Statistic	16.90441
A-D 5% Critical Value	0.882977
K-S Test Statistic	0.536066
K-S 5% Critical Value	0.131481
Data do not follow gamma distribution at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.177125
Adjusted Gamma UCL	0.179593

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.474198
Lilliefors 5% Critical Value	0.119468
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.032044
95% Chebyshev (MVUE) UCL	0.037963
97.5% Chebyshev (MVUE) UCL	0.046579
99% Chebyshev (MVUE) UCL	0.063504

95% Non-parametric UCLs	
CLT UCL	0.22994
Adj-CLT UCL (Adjusted for skewness)	0.302456
Mod-t UCL (Adjusted for skewness)	0.243396
Jackknife UCL	0.232085
Standard Bootstrap UCL	0.228377
Bootstrap-t UCL	1.543733
Hall's Bootstrap UCL	0.930344
Percentile Bootstrap UCL	0.246436
BCA Bootstrap UCL	0.388373
95% Chebyshev (Mean, Sd) UCL	0.432743
97.5% Chebyshev (Mean, Sd) UCL	**0.573678** ←
99% Chebyshev (Mean, Sd) UCL	0.850519

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\ProUCL files\[UCL stats for B ppm soil.xls]General Statistics

General Statistics

Data File	G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\Cumulative 1230 14th Soil & GW Summary.xls	Variable:	Toluene (ppm)

Raw Statistics	
Number of Valid Samples	55
Number of Unique Samples	7
Minimum	0.0025
Maximum	35
Mean	0.733482
Median	0.005
Standard Deviation	4.740328
Variance	22.47071
Coefficient of Variation	6.462775
Skewness	7.262977

Gamma Statistics	
k hat	0.163815
k star (bias corrected)	0.167
Theta hat	4.477513
Theta star	4.392096
nu hat	18.0196
nu star	18.37005
Approx.Chi Square Value (.05)	9.657428
Adjusted Level of Significance	0.045636
Adjusted Chi Square Value	9.486809

Log-transformed Statistics	
Minimum of log data	-5.99146
Maximum of log data	3.555348
Mean of log data	-4.94129
Standard Deviation of log data	1.769342
Variance of log data	3.130572

RECOMMENDATION
Data are Non-parametric (0.05)
Use 97.5% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.483278
Lilliefors 5% Critical Value	0.119468
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.8032

Gamma Distribution Test	
A-D Test Statistic	18.35303
A-D 5% Critical Value	0.934134
K-S Test Statistic	0.555493
K-S 5% Critical Value	0.134359
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.395205
Adjusted Gamma UCL	1.420298

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.489048
Lilliefors 5% Critical Value	0.119468
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.073853
95% Chebyshev (MVUE) UCL	0.079029
97.5% Chebyshev (MVUE) UCL	0.099405
99% Chebyshev (MVUE) UCL	0.139429

95% Non-parametric UCLs	
CLT UCL	1.784849
Adj-CLT UCL (Adjusted for skewness)	2.453717
Mod-t UCL (Adjusted for skewness)	1.90753
Jackknife UCL	1.8032
Standard Bootstrap UCL	1.76792
Bootstrap-t UCL	51.13405
Hall's Bootstrap UCL	48.57387
Percentile Bootstrap UCL	1.940282
BCA Bootstrap UCL	2.724536
95% Chebyshev (Mean, Sd) UCL	3.519627
97.5% Chebyshev (Mean, Sd) UCL	**4.725195**
99% Chebyshev (Mean, Sd) UCL	7.093299

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\ProUCL files\[UCL stats for T ppm soil.xls]General Statistics

General Statistics

Data File	G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\Cumulative 1230 14th Soil & GW Summary.xls	Variable:	Ethyl-benzene (ppm)

Raw Statistics	
Number of Valid Samples	55
Number of Unique Samples	8
Minimum	0.0025
Maximum	21
Mean	0.516989
Median	0.005
Standard Deviation	2.884579
Variance	8.320794
Coefficient of Variation	5.579574
Skewness	6.922984

Gamma Statistics	
k hat	0.177002
k star (bias corrected)	0.179469
Theta hat	2.920809
Theta star	2.880666
nu hat	19.47022
nu star	19.74154
Approx.Chi Square Value (.05)	10.65935
Adjusted Level of Significance	0.045636
Adjusted Chi Square Value	10.4791

Log-transformed Statistics	
Minimum of log data	-5.99146
Maximum of log data	3.044522
Mean of log data	-4.89638
Standard Deviation of log data	1.847421
Variance of log data	3.412963

RECOMMENDATION
Data are Non-parametric (0.05)
Use 97.5% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.483374
Lilliefors 5% Critical Value	0.119468
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.167933

Gamma Distribution Test	
A-D Test Statistic	17.64839
A-D 5% Critical Value	0.924852
K-S Test Statistic	0.540762
K-S 5% Critical Value	0.13388
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.957484
Adjusted Gamma UCL	0.973954

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.477026
Lilliefors 5% Critical Value	0.119468
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.094411
95% Chebyshev (MVUE) UCL	0.097649
97.5% Chebyshev (MVUE) UCL	0.123417
99% Chebyshev (MVUE) UCL	0.174031

95% Non-parametric UCLs	
CLT UCL	1.156766
Adj-CLT UCL (Adjusted for skewness)	1.544731
Mod-t UCL (Adjusted for skewness)	1.228448
Jackknife UCL	1.167933
Standard Bootstrap UCL	1.147535
Bootstrap-t UCL	6.00224
Hall's Bootstrap UCL	4.878854
Percentile Bootstrap UCL	1.255035
BCA Bootstrap UCL	1.82216
95% Chebyshev (Mean, Sd) UCL	2.212411
97.5% Chebyshev (Mean, Sd) UCL	**2.946022**
99% Chebyshev (Mean, Sd) UCL	4.387058

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\ProUCL files\[UCL stats for E ppm soil.xls]General Statistics

General Statistics

Data File	G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\Cumulative 1230 14th Soil & GW Summary.xls	Variable:	Xylenes (ppm)

Raw Statistics	
Number of Valid Samples	55
Number of Unique Samples	10
Minimum	0.0025
Maximum	150
Mean	3.233345
Median	0.005
Standard Deviation	20.28144
Variance	411.3368
Coefficient of Variation	6.272587
Skewness	7.281687

Gamma Statistics	
k hat	0.133184
k star (bias corrected)	0.13804
Theta hat	24.27733
Theta star	23.42319
nu hat	14.65021
nu star	15.18444
Approx.Chi Square Value (.05)	7.388817
Adjusted Level of Significance	0.045636
Adjusted Chi Square Value	7.242001

Log-transformed Statistics	
Minimum of log data	-5.99146
Maximum of log data	5.010635
Mean of log data	-4.69607
Standard Deviation of log data	2.273208
Variance of log data	5.167475

RECOMMENDATION
Data are Non-parametric (0.05)
Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.483214
Lilliefors 5% Critical Value	0.119468
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	7.810124
Gamma Distribution Test	
A-D Test Statistic	17.66424
A-D 5% Critical Value	0.955694
K-S Test Statistic	0.510614
K-S 5% Critical Value	0.13547
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	6.644709
Adjusted Gamma UCL	6.779416
Lognormal Distribution Test	
Lilliefors Test Statisitic	0.459014
Lilliefors 5% Critical Value	0.119468
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.400745
95% Chebyshev (MVUE) UCL	0.318246
97.5% Chebyshev (MVUE) UCL	0.410918
99% Chebyshev (MVUE) UCL	0.592953
95% Non-parametric UCLs	
CLT UCL	7.731607
Adj-CLT UCL (Adjusted for skewness)	10.60073
Mod-t UCL (Adjusted for skewness)	8.257649
Jackknife UCL	7.810124
Standard Bootstrap UCL	7.62795
Bootstrap-t UCL	61.09189
Hall's Bootstrap UCL	51.22513
Percentile Bootstrap UCL	8.600255
BCA Bootstrap UCL	13.7425
95% Chebyshev (Mean, Sd) UCL	15.15384
97.5% Chebyshev (Mean, Sd) UCL	20.31185
99% Chebyshev (Mean, Sd) UCL	**30.44375**

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\ProUCL files\[UCL stats for X ppm soil.xls]General Statistics

Groundwater Statistics

General Statistics

Data File	G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\Cumulative 1230 14th Soil & GW Summary.xls	Variable:	TPPH (µg/L)

Raw Statistics	
Number of Valid Samples	77
Number of Unique Samples	40
Minimum	0.5
Maximum	4200
Mean	295.7896
Median	2.2
Standard Deviation	768.8148
Variance	591076.1
Coefficient of Variation	2.599195
Skewness	3.505228

Gamma Statistics	
k hat	0.200558
k star (bias corrected)	0.201402
Theta hat	1474.832
Theta star	1468.651
nu hat	30.88596
nu star	31.01595
Approx.Chi Square Value (.05)	19.29125
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	19.11466

Log-transformed Statistics	
Minimum of log data	-0.69315
Maximum of log data	8.34284
Mean of log data	2.021883
Standard Deviation of log data	3.071357
Variance of log data	9.433232

RECOMMENDATION
Data are Non-parametric (0.05)
Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.35377097
Lilliefors 5% Critical Value	0.10096907
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	441.681113

Gamma Distribution Test	
A-D Test Statistic	7.41409753
A-D 5% Critical Value	0.90994843
K-S Test Statistic	0.23173633
K-S 5% Critical Value	0.1127166
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	475.562547
Adjusted Gamma UCL	479.955967

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.25935493
Lilliefors 5% Critical Value	0.10096907
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	4573.91182
95% Chebyshev (MVUE) UCL	2306.06712
97.5% Chebyshev (MVUE) UCL	3034.18064
99% Chebyshev (MVUE) UCL	4464.41868

95% Non-parametric UCLs	
CLT UCL	439.902761
Adj-CLT UCL (Adjusted for skewness)	477.298982
Mod-t UCL (Adjusted for skewness)	447.514167
Jackknife UCL	441.681113
Standard Bootstrap UCL	438.850937
Bootstrap-t UCL	514.548923
Hall's Bootstrap UCL	482.374954
Percentile Bootstrap UCL	448.711169
BCA Bootstrap UCL	488.314156
95% Chebyshev (Mean, Sd) UCL	677.692685
97.5% Chebyshev (Mean, Sd) UCL	842.942451
99% Chebyshev (Mean, Sd) UCL	**1167.54362** ←

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\ProUCL files\[UCL stats for TPHg.xls]General Statistics

General Statistics

Data File	G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\Cumulative 1230 14th Soil & GW Summary.xls	Variable:	B (µg/L)

Raw Statistics	
Number of Valid Samples	77
Number of Unique Samples	39
Minimum	0.5
Maximum	2200
Mean	267.1364
Median	3.6
Standard Deviation	468.8561
Variance	219826
Coefficient of Variation	1.755119
Skewness	2.010183

Gamma Statistics	
k hat	0.223768
k star (bias corrected)	0.223708
Theta hat	1193.808
Theta star	1194.129
nu hat	34.46032
nu star	34.45104
Approx.Chi Square Value (.05)	22.02299
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	21.83331

Log-transformed Statistics	
Minimum of log data	-0.69315
Maximum of log data	7.696213
Mean of log data	2.356668
Standard Deviation of log data	3.205836
Variance of log data	10.27739

RECOMMENDATION
Data are Non-parametric (0.05)
Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.338337
Lilliefors 5% Critical Value	0.100969
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	356.1072

Gamma Distribution Test	
A-D Test Statistic	6.388018
A-D 5% Critical Value	0.899488
K-S Test Statistic	0.236266
K-S 5% Critical Value	0.112201
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	417.8872
Adjusted Gamma UCL	421.5177

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.257854
Lilliefors 5% Critical Value	0.100969
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	11233.69
95% Chebyshev (MVUE) UCL	4860.286
97.5% Chebyshev (MVUE) UCL	6415.148
99% Chebyshev (MVUE) UCL	9469.373

95% Non-parametric UCLs	
CLT UCL	355.0227
Adj-CLT UCL (Adjusted for skewness)	368.1014
Mod-t UCL (Adjusted for skewness)	358.1472
Jackknife UCL	356.1072
Standard Bootstrap UCL	354.4507
Bootstrap-t UCL	371.243
Hall's Bootstrap UCL	370.2674
Percentile Bootstrap UCL	357.2143
BCA Bootstrap UCL	370.3403
95% Chebyshev (Mean, Sd) UCL	500.0372
97.5% Chebyshev (Mean, Sd) UCL	600.8135
99% Chebyshev (Mean, Sd) UCL	**798.7692** ←

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\ProUCL files\[UCL stats for B.xls]General Statistics

General Statistics

Data File	G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\Cumulative 1230 14th Soil & GW Summary.xls	Variable:	T (µg/L)

Raw Statistics	
Number of Valid Samples	77
Number of Unique Samples	39
Minimum	1
Maximum	6500
Mean	532.8312
Median	5
Standard Deviation	1258.952
Variance	1584961
Coefficient of Variation	2.36276
Skewness	3.436132

Gamma Statistics	
k hat	0.211575
k star (bias corrected)	0.21199
Theta hat	2518.399
Theta star	2513.471
nu hat	32.58261
nu star	32.64649
Approx.Chi Square Value (.05)	20.58326
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	20.40037

Log-transformed Statistics	
Minimum of log data	0
Maximum of log data	8.779557
Mean of log data	2.830463
Standard Deviation of log data	3.106097
Variance of log data	9.647842

RECOMMENDATION
Data are Non-parametric (0.05)
Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.336352158
Lilliefors 5% Critical Value	0.100969071
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	771.7319328

Gamma Distribution Test	
A-D Test Statistic	6.677474905
A-D 5% Critical Value	0.904983328
K-S Test Statistic	0.233171964
K-S 5% Critical Value	0.112471911
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	845.107399
Adjusted Gamma UCL	852.6837851

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.260479307
Lilliefors 5% Critical Value	0.100969071
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	11849.38522
95% Chebyshev (MVUE) UCL	5750.166888
97.5% Chebyshev (MVUE) UCL	7572.16098
99% Chebyshev (MVUE) UCL	11151.11557

95% Non-parametric UCLs	
CLT UCL	768.8198394
Adj-CLT UCL (Adjusted for skewness)	828.8498983
Mod-t UCL (Adjusted for skewness)	781.0954089
Jackknife UCL	771.7319328
Standard Bootstrap UCL	765.7400487
Bootstrap-t UCL	861.5738629
Hall's Bootstrap UCL	888.7202234
Percentile Bootstrap UCL	765.8662338
BCA Bootstrap UCL	841.5714286
95% Chebyshev (Mean, Sd) UCL	1158.20643
97.5% Chebyshev (Mean, Sd) UCL	1428.806805
99% Chebyshev (Mean, Sd) UCL	**1960.348843**

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\ProUCL files\[UCL stats for T.xls]General Statistics

General Statistics

Data File	G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\Cumulative 1230 14th Soil & GW Summary.xls	Variable:	E (µg/L)

Raw Statistics	
Number of Valid Samples	77
Number of Unique Samples	23
Minimum	0
Maximum	2100
Mean	34.16234
Median	0
Standard Deviation	244.7619
Variance	59908.37
Coefficient of Variation	7.16467
Skewness	8.20112

Gamma Statistics Not Available

Lognormal Statistics Not Available

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.515733
Lilliefors 5% Critical Value	0.100969
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	80.60874

95% Non-parametric UCLs	
CLT UCL	80.04257
Adj-CLT UCL (Adjusted for skewness)	107.8978
Mod-t UCL (Adjusted for skewness)	84.95359
Jackknife UCL	80.60874
Standard Bootstrap UCL	78.98797
Bootstrap-t UCL	1473.731
Hall's Bootstrap UCL	1542.11
Percentile Bootstrap UCL	88.05195
BCA Bootstrap UCL	143.9026
95% Chebyshev (Mean, Sd) UCL	**155.746** ←
97.5% Chebyshev (Mean, Sd) UCL	208.3553
99% Chebyshev (Mean, Sd) UCL	311.6962

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\ProUCL files\[UCL stats for E.xls]General Statistics

General Statistics

Data File	G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\Cumulative 1230 14th Soil & GW Summary.xls	Variable:	X (µg/L)
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	77	Lilliefors Test Statisitic	0.360194
Number of Unique Samples	48	Lilliefors 5% Critical Value	0.100969
Minimum	0	Data not normal at 5% significance level	
Maximum	6500		
Mean	487.2468	95% UCL (Assuming Normal Distribution)	
Median	1	Student's-t UCL	726.3698
Standard Deviation	1260.123		
Variance	1587911		
Coefficient of Variation	2.586212		
Skewness	3.529789		
Gamma Statistics Not Available			
Lognormal Statistics Not Available			
		95% Non-parametric UCLs	
		CLT UCL	723.455
		Adj-CLT UCL (Adjusted for skewness)	785.1786
		Mod-t UCL (Adjusted for skewness)	735.9974
		Jackknife UCL	726.3698
		Standard Bootstrap UCL	732.2619
		Bootstrap-t UCL	861.12
RECOMMENDATION		Hall's Bootstrap UCL	806.516
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	748.8753
		BCA Bootstrap UCL	792.061
Use 95% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	**1113.204**
		97.5% Chebyshev (Mean, Sd) UCL	1384.056
		99% Chebyshev (Mean, Sd) UCL	1916.092
G:\Oakland 1230 14th\2005 SCM and RBCA Update\Tables\ProUCL files\[UCL stats for X.xls]General Statistics			

ATTACHMENT G

Oakland ULR RBCA Cover Sheet, Eligibility Checklist,

Exposure Assessment Worksheet,

Merritt Sands Input Parameters,

and Chemical Parameters

Oakland RBCA Cover Sheet

Project Proponent: Shell Oil Products US / Cambria Environmental Technology, Inc.
Site Address: 1230 14th St, Oakland
Alameda County Parcel Number(s): 5-377-19-1

Chemicals of Concern		
(1) Benzene	(4) Xylenes	(7)
(2) Toluene	(5)	(8)
(3) Ethylbenzene	(6)	(9)

Exposure Pathways of Concern

Surficial Soil
- ☒ Ingestion/dermal contact/inhalation

Subsurface Soil
- ☐ Ingestion of groundwater impacted by leachate
- ☒ Inhalation of indoor air vapors
- ☒ Inhalation of outdoor air vapors

Groundwater
- ☐ Ingestion of groundwater
- ☒ Inhalation of indoor air vapors
- ☒ Inhalation of outdoor air vapors

Water Used for Recreation
- ☐ Ingestion/dermal contact

Land Use Scenario

☒ Residential ☒ Commercial/Industrial

Method of Analysis

☐ Tier 1
☒ Tier 2 (specify soil type: ☒ Merritt sands ☐ sandy silts ☐ clayey silts)
☐ Tier 3 Model(s) employed: ☐ Oakland RBCA ☐ Other(s) (specify:)

Application of RBCA Levels

☒ As evidence that no further action required
☐ As target cleanup levels for removal or treatment of chemical(s) of concern
☐ Other (specify:)

Containment Measures

☐ Cap (specify material:) ☐ Vapor barrier (specify material:)
☐ Other(s) (specify:)
Exposure pathways that will be affected:

Institutional Controls

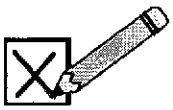
☒ Permit tracking ☐ Deed restriction ☐ Deed Notice ☒ Water well restriction
☐ Access control ☐ Other(s) (specify:)

Public Notification

Specify all actions to be taken:

Submitted by: Matthew W. Derby, Cambria Environmental Technology **Date submitted:** April 2005

Oakland RBCA Eligibility Checklist



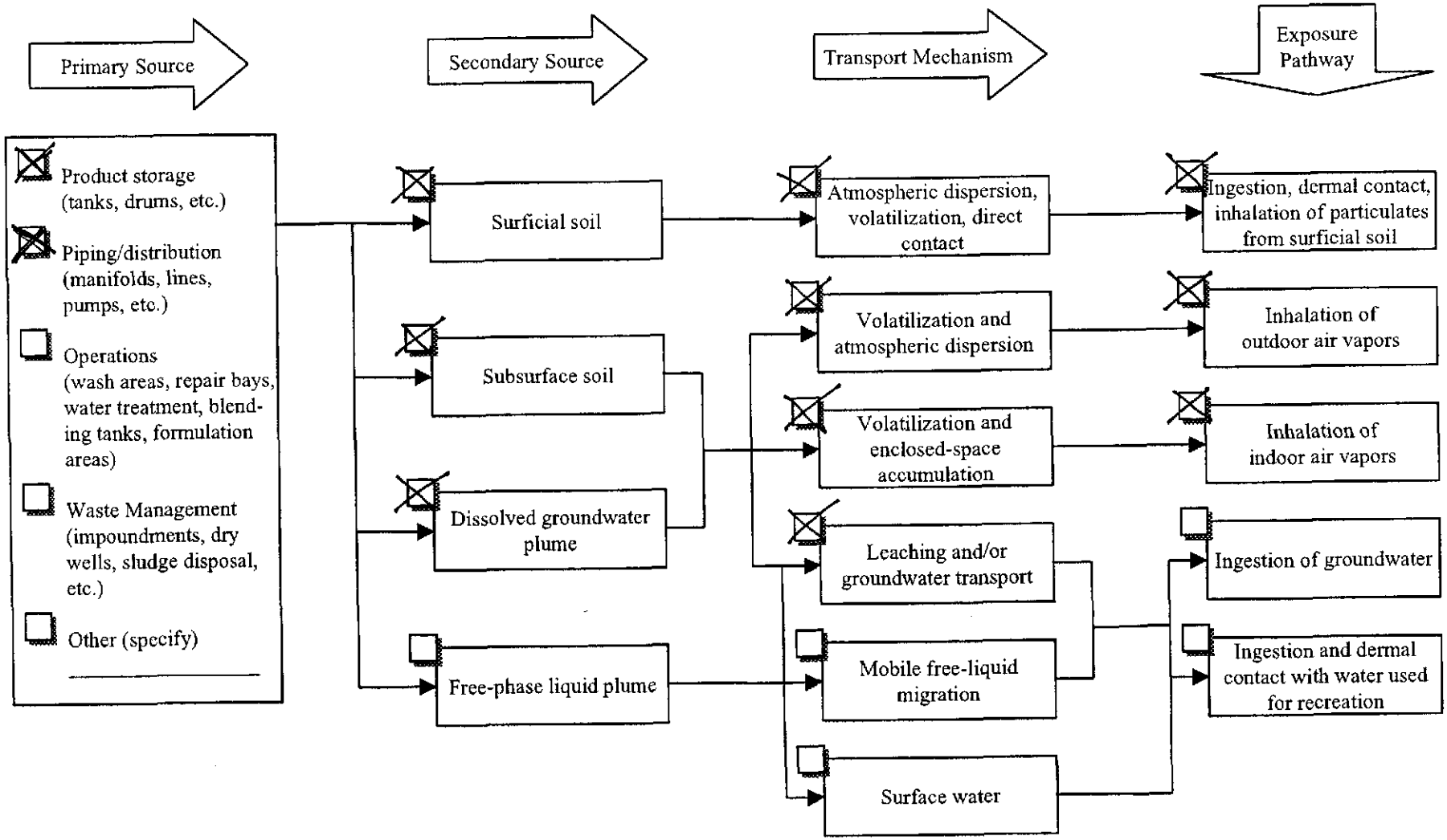
The Oakland Tier 1 RBSLs and Tier 2 SSTLs are intended to address human health concerns at the majority of sites in Oakland where commonly-found contaminants are present. Complicated sites—especially those with continuing releases, ecological concerns or unusual subsurface conditions—will likely require a Tier 3 analysis. The following checklist is designed to assist you in determining your site's eligibility for the Oakland RBCA levels.

CRITERIA	YES	NO
1. Is there a continuing, *primary* source of a chemical of concern, such as a leaking container, tank or pipe? (This does *not* include residual sources.)	☐	☒
2. Is there any mobile or potentially-mobile free product?	☐	☒
3. Are there more than five chemicals of concern at the site at a concentration greater than the lowest applicable Oakland RBCA level?	☐	☒
4. Are there any preferential vapor migration pathways—such as gravel channels or utility corridors—that are potential conduits for the migration, on-site or off-site, of a volatilized chemical of concern?	☐	☒
5. Do both of the following conditions exist? (a) Groundwater is at depths less than 300 cm (10 feet) (b) Inhalation of volatilized chemicals of concern from groundwater in indoor or outdoor air is a pathway of concern but groundwater ingestion is *not**	☐	☒
6. Are there any existing on-site or off-site structures intended for future use where exposure to indoor air vapors from either soil or groundwater is of concern *and* one of the following three conditions is present? (a) A slab-on-grade foundation that is less than 15 cm (6 inches) thick (b) An enclosed, below-grade space (e.g., a basement) that has floors or walls less than 15 cm (6 inches) thick (c) A crawl space that is not ventilated	☐	☒
7. Are there any immediate, acute health risks to humans associated with contamination at the site, including explosive levels of a chemical?	☐	☒
8. Are there any complete exposure pathways to nearby ecological receptors, such as endangered species, wildlife refuge areas, wetlands, surface water bodies or other protected areas?	☐	☒

*If groundwater ingestion *is* a pathway of concern, the associated Oakland RBCA levels will be more stringent than those for any groundwater-related inhalation scenario, rendering depth to groundwater irrelevant in the risk analysis.

If you answer "no" to all questions, your site is eligible for the Oakland RBCA levels. If you answer "yes" to any of the questions, your site is *not* eligible for the Oakland RBCA levels at this time.

Figure 5. Oakland RBCA Exposure Assessment Worksheet



Merritt Sands Default Inputs

		Residential		Commercial/ Industrial
Input Parameters	**Units**	**Child**	**Adult**	**Worker**
Soil-Specific Parameters				
Capillary fringe thickness	cm	=adult residential	10.1	=adult residential
Capillary fringe air content	cm^3/cm^3		0.025	
Capillary fringe water content	cm^3/cm^3		0.325	
Fraction organic carbon (FOC*)	g oc/g soil		0.01	
Groundwater Darcy velocity	cm/yr		600	
Groundwater mixing zone thickness	cm		305	
Infiltration rate through the vadose zone	cm/yr		9	
Soil bulk density	g/cm^3		1.72	
Soil to skin adherence factor	mg/cm^2	0.2	0.2	0.2
Total soil porosity	cm^3/cm^3	=adult residential	0.35	=adult residential
Vadose zone air content	cm^3/cm^3		0.2	
Vadose zone water content	cm^3/cm^3		0.15	
Vadose zone thickness	cm		289.9	
Structural and Climatic Parameters				
Areal fraction of cracks in building foundation	cm^2/cm^2	=adult residential	0.001	0.001
Foundation air content	cm^3/cm^3		0.26	=adult residential
Foundation water content	cm^3/cm^3		0.12	
Foundation thickness	cm		15	15
Lower depth of surficial soil zone	cm		100.0	=adult residential
Depth to subsurface soil sources	cm		100	
Depth to groundwater	cm		300	
Width of source area parallel to wind or groundwater flow direction	cm		1500	
Outdoor air mixing zone height	cm		200	
Particulate emission rate	g/cm^2-*s*		1.38E-11	1.38E-11
Wind speed above ground surface in outdoor air mixing zone	cm/s		322	=adult residential

Merritt Sands Default Inputs

		Residential		Commercial/ Industrial
Input Parameters	**Units**	**Child**	**Adult**	**Worker**
Exposure Parameters				
Averaging time for carcinogens	yr	=adult residential	70	=adult residential
Averaging time for non-carcinogens	yr	6	24	25
Averaging time for vapor flux	s	=adult residential	9.46E+08	7.88E+08
Body weight	kg	15	70	70
Building air volume/floor area	cm^3/cm^2	=adult residential	229	305
Exposure duration	yr	6	24	25
Exposure frequency	d/yr	350	350	250
Exposure frequency to water used for recreation	d/yr	120	120	0
Exposure time to indoor air	hr/d	24	24	9
Exposure time to outdoor air	hr/d	16	16	9
Exposure time to water used for recreation	hr/d	2	1.0	0
Groundwater ingestion rate	L/d	1	2	1
Indoor air exchange rate	1/s	=adult residential	5.60E-04	1.40E-03
Indoor inhalation rate	m^3/d	10	15	20
Ingestion rate of water used for recreation	L/hr	0.05	0.05	0
Outdoor inhalation rate	m^3/d	10	20	20
Skin surface area exposed to soil	cm^2	2000	5000	5000
Skin surface area exposed to water used for recreation	cm^2	8000	20000	0
Soil ingestion rate	mg/d	200	100	50
TARGET RISK LEVELS				
Individual Excess Lifetime Cancer Risk	unitless	=adult residential	1.0E-05	1.0E-05
Hazard quotient	unitless		1.0	1.0

G:\Oakland 1230 14th\2005 SCM and RBCA Update\Oakland RBCA documents\[wksheet2.xls]Inputs

Table C-1. Chemical Properties

Parameter	Units	Benzene	Ethyl-benzene	Toluene	Xylenes
Toxicity Data					
Slope Factor Oral	1/(mg/kg-d)	1.00E-01	ND	ND	ND
Slope Factor Inhalation	1/(mg/kg-d)	1.00E-01	ND	ND	ND
RfD Oral	mg/kg-d	1.70E-03	1.00E-01	2.00E-01	2.00E+00
RfD Inhalation	*mg/kg-d*	1.70E-03	2.90E-01	1.14E-01	2.00E-01
Absorption Adjustment Factor: Oral-Soil	-	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Absorption Adjustment Factor: Oral-Water	-	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Absorption Adjustment Factor: Dermal-Soil	-	1.00E-01	1.00E-01	1.00E-01	1.00E-01
Absorption Adjustment Factor: Dermal-Water	-	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Absorption Adjustment Factor: Inhalation	-	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Skin Permeability Coefficient	cm/hr	2.10E-02	7.40E-02	4.50E-02	8.00E-02
Maximum Contaminant Levels (MCLs)	mg/L	1.00E-03	7.00E-01	1.50E-01	1.75E+00
Fate and Transport Parameters					
Solubility	mg/L	1.75E+03	1.69E+02	5.26E+02	1.98E+02
Henry's Law Constant (no NDs)	-	2.28E-01	3.23E-01	2.72E-01	2.90E-01
Koc (for organics, ND for inorganics)	ml/g	5.89E+01	3.63E+02	1.82E+02	2.40E+02
Kd (partition coefficient for inorganics)	ml/g	ND	ND	ND	ND
Diffusion Coeff. in Air	cm^2/s	8.80E-02	7.50E-02	8.70E-02	7.20E-02
Diffusion Coefficient in Water	cm^2/s	9.80E-06	7.80E-06	8.60E-06	8.50E-06
Other Data (not used in RBCA equations)					
CAS Number	-	71-43-2	100-41-4	108-88-3	1330-20-7